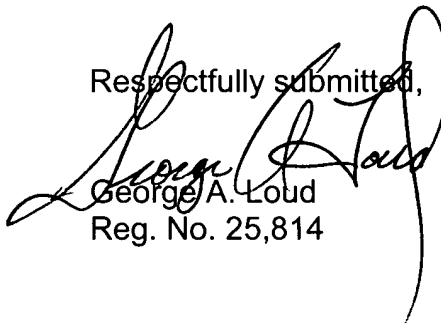


REMARKS

A Substitute Specification and Abstract is submitted herewith to place the case in better English form. The Substitute Specification and Abstract contains no new matter. In order that the examiner can satisfy himself in this regard, also submitted herewith is a marked-up copy of the original Specification and Abstract from which the Substitute Specification and Abstract was typed.

Respectfully submitted,



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DESCRIPTION

AUTOMATIC TRANSMISSION

Technical Field

The present invention relates to an automatic transmission mounted on a vehicle ~~and so forth~~, and more specifically, it relates to the ~~construction configuration~~ ^{design} of an automatic transmission wherein multiple speed levels ~~each established by~~ ^{of} ~~are enabled by being capable of inputting~~ ^{speed} reduced rotation into one of the ~~rotation~~ ^{rotatable} components of a planetary gear unit.

Background Art

Generally, ~~an~~ ^{a vehicular} automatic transmission ~~on board a vehicle~~ ^{units} ~~and so forth~~ comprises ~~a planetary gear unit with two rows~~ ^{gearing for} ~~of~~ linked planetary gears, and planetary gears that can ~~output the reduced rotation wherein the rotation speed of~~ ^{rotation receives} ~~from~~ the input shaft ~~is reduced~~ (for example, see Japanese

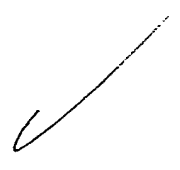
Unexamined Patent Application Publication No. 4-125345).

^{Such a transmission}

~~This~~ achieves, for example, six forward speeds and one ^{speed} reverse speed, by ~~being capable of~~ input of reduced rotation from the planetary gear ^{via} via a clutch to, for example, one ~~rotation~~ ^{ry} component of a planetary gear unit that has four ~~rotation~~ ^{rotary} components. Further, in the case of fifth speed forward, for example, when the rotation of the input shaft is input ~~together~~ ^{simultaneously} into two of the ~~rotation~~ ^{ry} components of the

planetary gear unit by engaging ~~the~~ two clutches, this fifth speed forward ^{speed is a} ~~can be become~~ directly coupled, with ^{state} ~~a~~ rotation similar to that of the input shaft (see Japanese Unexamined Patent Application Publication No. 2000-274498, for example).

The above-described automatic transmission comprises two clutches for inputting ^{of} ~~the~~ rotation of the input shaft into two of the rotation ^{of} ~~components~~ of the aforementioned planetary gear unit, and ~~a~~ planetary gear ^{ing, reducing the speed of} ~~for outputting the~~ ^{input} ~~reduced~~ rotation into the rotation ^{of} ~~components~~ of this planetary gear unit. However, if those two clutches or the oil servos that control the engaging ^{ment} ~~of~~ those clutches are ^{located} ~~configured~~ between the planetary gear unit and the ^{speed-reduction} ~~planetary~~ gear, ^{ing element(s)} ~~the unit~~ for transmitting the reduced rotation of this ^{speed-reduction} ~~planetary gear~~ to the rotation ^{of} ~~components~~ of the planetary gear unit ^{must be} ~~becomes long in the axial~~ ^{lengthened} ~~direction.~~ ^{The axial lengthening of the element(s)} ~~That the unit that transmits the reduced rotation~~ ^{speed} ~~becomes long~~ means that the unit transmitting a large torque is elongated, and an elongated unit that can withstand the large torque requires ^{elongation of} ~~providing~~ a relatively thick material ~~that is elongated~~, preventing a compact automatic transmission. Further, the weight of such a unit would be heavier, and not only would a lightweight automatic transmission ^{become impossible} ~~be prevented~~, but inertia ^{thereby} ~~(force of inertia) force~~ would increase, ^{thereby} ~~reducing~~ the controllability of the



automatic transmission and speed change shocks would ~~result~~ ^{become} more ~~easily~~ ^{likely to occur.}

~~Further, for example,~~ ^{speed} In order to engage or disengage the reduced rotation output to the planetary gear unit from ^{speed reduction} the planetary gear, a clutch or brake must be provided. ~~In~~ ^{When} the case that a clutch is provided, this clutch and the ^{mentioned} above-described two clutches, in other words three clutches, are necessary. In general, a clutch has a drum-shaped member (clutch drum) that transmits the input rotation ~~to~~ the friction plates, and therefore, for example with a problem such as relative rotation, supplying ^{of} oil pressure to the oil compartment of the ~~oil pressure~~ ^{hydraulic} servo of the clutch must ~~be supplied~~ ^{come} from the mid-section of the automatic transmission.

However, ~~for example if~~ ^{the required} those three clutches are ^{located} ~~configured on one side in the direction of the axis~~ ^{axial} of the planetary gear unit, oil lines for supplying oil pressure to three ^{hydraulic} oil pressure servos are ^{provided} ~~constructed for example~~ in triplicate in the mid-section of the automatic transmission, and the configuration of the oil lines become ^s complicated.

SUMMARY OF THE INVENTION

Accordingly, the object of the present invention is to provide an automatic transmission ^{wherein} that ~~configures~~ a reduced ^{speed} rotation output means ^{is located axial} on one ^{side} ~~in the axial direction~~ of the planetary gear unit, and ~~configures~~ ^{are located} a first clutch and a second clutch ^{axial} ~~in the axial direction~~ on the other ^{side} of

the planetary gear unit, and hence ^{to} solve the problems mentioned above.

^{one}
~~Disclosure of Invention~~

^{In aspect,}
The present invention ~~according to Claim 1~~ is an automatic transmission comprising: an input shaft ~~that~~ ^{ably driven by} rotates ~~based on~~ output rotation of a drive source; a

planetary gear unit comprised of first, second, third, and

fourth ^{rotary} rotation components; reduced ^{speed} rotation output means ^{for reducing the} ~~capable of~~ output of a reduced ^{speed} rotation to the first

^{rotary} rotation component ~~from the input shaft wherein the rotation~~ ^{for selectively engaging/disengaging} speed is reduced; a first clutch that links the input shaft

^{to/from} and the second rotation component ~~in a manner capable of~~ ^{for selectively engaging/disengaging} disengaging; a second clutch ^{to/from} that links the input shaft and

^{to/from} the third rotation component ~~in a manner capable of~~ ^{for} disengaging; and an output unit for outputting the rotation of the fourth rotation component ~~as~~ ^{to} the drive wheels

transmitting device; wherein at least five forward speeds ^{are} levels and one reverse speed level can be achieved, and

wherein a direct ^{coupled state} linking level can be achieved wherein the rotations of the input shaft ^{is} ~~are~~ output without change ^{in speed} by

^{engagement of} the first clutch and the second clutch ~~being engaged~~ while ^{at} fifth speed forward ~~at least~~ or higher; and wherein the reduced ^{speed} rotation output means ^{is} ~~is configured~~ ^{located} on one side ^{axial} in

~~the axial direction~~ of the planetary gear unit, and ~~the~~ ^{an}

output member is ^{located} ~~configured~~ between the planetary gear unit and the reduced ^{speed} rotation output means; and wherein the first clutch and the second clutch are ^{located} ~~configured~~ on the other ^{axial} side ~~in the axial direction~~ of the planetary gear unit.

Accordingly, while providing an automatic transmission ^{which is} directly coupled ⁱⁿ ~~when at~~ fifth speed forward, which ~~can~~ ^{provides} ~~achieve~~ at least five forward speed ^s ~~levels~~ and one reverse speed ~~level~~, the reduced rotation output means and the planetary gear unit can be ^{located} ~~configured~~ closer together, ^{located} as compared to the case wherein a clutch is ~~configured~~ between the reduced ^{speed} rotation output means and the planetary gear unit, for example, and the transmitting ^{element(s)} ~~member~~ for transmitting the reduced ^{speed} rotation can be made relatively short. Therefore, the automatic transmission can be made compact and lightweight, and further, because the inertia ^{force} ~~(force of inertia)~~ can be reduced, the controllability of the automatic transmission can be improved, and the occurrence of speed change shock can be reduced. Further, in the case that, for example, the reduced ^{speed} rotation output means has a clutch, three clutches ^{are required} ~~will be configured~~, but compared to the case wherein three clutches are ^{located} ~~configured~~ on one side of the planetary gear unit, the construction of ^{the} an oil line ^s ~~to provide oil to the~~ ^{which supply} ~~oil pressure~~ ^{to the hydraulic} servos for these clutches ^{is simplified} ~~can be made easily~~, and the manufacturing process ^{is} ~~can be~~ simplified and the costs ^{are reduced} ~~brought down~~.

^{manufacturing}



Further, because the output unit is ^{located} ~~configured in the~~ ^{intermediate} axial direction between the planetary gear unit and the reduced speed rotation output means, the output unit can be ^{located} ~~configured in approximately the center in the axial~~ direction of the automatic transmission. For example, when the automatic transmission is mounted on ^a ~~the~~ vehicle, enlarging towards ^{output} ~~one direction of the axis (particularly in the rear direction)~~ (when the input side ^{for receiving power} from the drive source is the front direction) ^{becomes unnecessary} ~~can be prevented~~ because the output unit is mounted to ^{mate with} ~~match~~ the drive wheel transmission mechanism. Because of this, particularly in the case of a FF vehicle, ^{with} ~~the~~ interference ^{toward} the front wheels is reduced, and the mountability on a vehicle ^{is} ~~can be improved~~, ^{is} ~~such~~ the steering angle ^{being} greatly improved. For example,

~~The present invention according to Claim 2 is~~ ^{The} configured such that reduced rotation output means ^{preferably includes} ~~comprises~~ ^{speed} a reducing planetary gear ^{unit} that has a reduced rotation ^{speed} component that rotates at the reduced rotation and a third engaging component ^{for controlling} ~~that can operate~~ the rotation of ^{the speed} ~~the~~ specified component of ^{unit} ~~this~~ reducing planetary gear.

^{16 #} ~~The present invention according to Claim 3 is~~ ^{Preferably,} configured such that the third engaging component ~~is an~~ engaging component which engages in the first speed forward.

~~With the present invention according to Claim 4,~~ ^{the speed} ~~the~~ reducing planetary gear ^{unit preferably includes} ~~comprises~~ an input rotation

and a third component that is fixed so as to receive speed reduction, whereby the reduced speed rotates at a speed component

continuously receives 25

component that inputs at all times the rotation of the input shaft, a rotation fixing component that fixes the rotation speed r_1 and a reduced rotation component that can reduce rotation at a reduced speed based on the rotation of this input rotation component and fixation of this ~~rotation~~ ^{the} ~~rotation~~ ^{speed r_1} component; and the third engaging component is a third clutch that links the reduced rotation component to/from rotary component and the first rotation component, so as to be capable of disengaging.

Accordingly, because the reduced rotation output means includes a speed comprises the third clutch, three clutches in total are required configured, but because the reduced rotation output means is located axial speed in second planetary gear unit configured on one side in the axial direction of the first planetary gear unit, and the first clutch and the second clutch are configured on the other side in the axial direction of planetary gear unit, compared to the case a design wherein these three clutches are configured on one side of the first planetary gear unit, the construction of an oil line to provide oil to the hydraulic oil pressure servos for these clutches is simplified, and the manufacturing process can be simplified and the costs brought down.

With the present invention according to Claim 5, the third clutch is preferably located of the first planetary gear unit opposite speed (second) direction of the reducing planetary gear unit, from the first planetary gear, and the third clutch comprises an oil hydraulic engages pressure servo that pressurizes a friction member, a drum

non-rotatable, In preferred embodiments the third component is a carrier fixed to the transmission case through an end plate and in other preferred embodiments is a carrier rotatable which is fixed against rotation by engagement by a brake.

unit that is constructed integrally with the ^{third hydraulic} oil pressure servo and opens toward ^{speed} the direction of the reducing planetary gear, ^{unit} and a hub unit; wherein the ^{third hydraulic} oil pressure servo of the ~~third clutch~~ is disposed on a boss ~~portion~~ ^{hydraulic} extending from the case, and oil is supplied to the oil pressure servo from an oil path ⁱⁿ provided to the boss, ~~portion~~.

~~In another embodiment~~
The present invention according to Claim 6 is configured with ^{+ speed} the reducing ^{second} planetary gear ^{unit} comprising an input ^{rotary} component that ^{receives as} can input the rotation of the input shaft, ^{a third component} a rotation fixing component that ^{against} fixed the rotation, and a reduced ^{speed} rotation component that ^{rotates at a} can reduce ^{reduced} rotation speed based on the rotation of ^{the} this input rotation component and ^{the} this ^{ed carrier} rotation fixing component; wherein the third engaging component is a third clutch that ^{engages/disengages} links the input shaft ^{to/from} and the input rotation component, so as to be capable of disengaging ^{describes also} the input rotation component. Accordingly, because the ^{speed} reduced rotation output means

^{are} comprises the third clutch, three clutches ^{will be} required ^{here to speed in second planetary gear unit} configured, but because the reduced rotation output means is ^{located} ^{The} configured on one side in the axial direction of the ^{first} planetary gear unit, ^{opposite and second etc.} and the first clutch and the second clutch are configured on the other side in the axial direction of planetary gear unit, compared to the case wherein these three clutches are configured on one side of the planetary gear unit, the construction of an oil line to

~~provide oil to the oil pressure servos for these clutches
can be made easily, and the manufacturing process can be
simplified and the costs brought down.~~

Further, because the third clutch ^{engagement of} ~~links~~ ^{connects} the input shaft and the input rotation ^{rx} ~~component so as to be capable of~~ ^{load} ~~disengaging~~, the ~~burden~~ on the third clutch can be reduced, and the third clutch can be made more compact, ^{as} ~~compared with~~ ^{connects} ~~for example~~ the case wherein the third clutch ~~makes~~ the input rotation ^{rx} ~~component~~ and the first rotation ^{rx} ~~component~~ ~~capable of disengaging~~.

~~With the present invention according to Claim 7, the~~ ^{a hydraulic} ~~third clutch comprises an oil pressure servo that~~ ^{engages} ~~pressurizes a friction member,~~ ⁵ ~~a drum unit that is~~ ^{hydraulic} ~~constructed integrally with the oil pressure servo, and a~~ ~~hub unit; wherein the hub unit is linked with the input~~ ^{rx} ~~rotation component; and wherein the drum unit is linked to~~ ~~the input shaft, and is positioned so as to open toward the~~ ^{speed} ~~direction of the~~ ^{second} ~~reducing~~ ^{unit} ~~planetary gear.~~

Also, the input rotation ^{rx} ~~component~~ which rotates at a ^{speed in} ~~high revolution when at sixth speed forward~~ can be linked to the hub unit which has a smaller diameter than the drum unit, ^{and} ~~as~~ ^{is} ~~compared to the case wherein it is linked to the drum~~ ~~unit, the centrifugal force can be reduced, and the decrease~~ ^{operation of} ~~of controllability of the third clutch when engaging and~~ ^{is improved,} ~~releasing can be prevented.~~

~~The present invention according to Claim 8 is~~
~~configured with the oil pressure servo of the third clutch~~ *may be mounted*
~~disposed on the input shaft, wherean oil is supplied to the~~ *it can receive of oil*
~~oil pressure servo of the third clutch via an oil path~~
~~provided within the input shaft.~~ *Alternatively,*

No A →
~~The present invention according to Claim 9 is~~
~~configured with the oil pressure servo of the third clutch~~ *hydraulic*
~~disposed on a boss portion extending from the case, where~~ *mounted*
supply of ~~oil is supplied to the oil pressure servo of the third~~
~~clutch via an oil path provided within the boss portion.~~

In another embodiment
~~The present invention according to Claim 10 is~~
~~configured with the reducing planetary gear~~ *speed second unit comprises*
receives as ~~comprising an~~
~~input rotation component that inputs the rotation of the~~

~~input shaft, a fixing rotation component that fixes the~~
~~rotation, and a reduced rotation component that can reduce~~ *speed*
whereby said reduced as at a reduced
~~rotation speed based on the rotation of the input rotation~~
~~component and the rotation fixing component wherein the~~ *with 3rd third fixed against rotation, and*
speed rotary component ~~third engaging component is a third brake that is capable of~~
for ~~fixing the fixing rotation component.~~ *rotatable third component against rotation.*

~~With the present invention according to Claim 11, the~~
may be located
~~third brake is configured on the opposite side in the axial~~ *of the first*
planetary gear unit opposite
~~direction of the reducing planetary gear unit, from the~~
speed ~~planetary gear; and the oil pressure servo of the third~~ *hydraulic*
may be formed in the end
~~brake is configured on the edge wall of the case.~~

In another preferred embodiment
~~The present invention according to Claim 12 is~~

~~configured, such that the first clutch is a clutch that~~
engages at ⁱⁿ the first speed reverse.

No ④ → Accordingly, when engaged ⁱⁿ at the reverse speed level, ^{rotates in reverse at} ~~the~~ ^{one} unit (particularly the transmitting member) ^{for the} ~~reduced rotation of~~ ^{speed from speed} the reduced rotation output means, while

~~rotates in a reverse rotation, while there may be cases~~
~~wherein by engaging this first clutch, the unit connecting~~
~~this first clutch and the second rotation component rotates~~
at the ^{speed} ~~rotation~~ of the input shaft, ^{engaged} ~~and some cases may occur~~
~~wherein the revolution difference thereof may be large.~~ ^{between these speeds}

However, because ^{the} ~~this~~ first clutch is located on the ^{opposite the speed} ~~opposite~~ side of the reduced rotation output means, ~~via the~~

^{first} ~~first~~ planetary gear unit, ~~that is to say, the unit with a reverse~~
rotation (particularly the transmitting member) and the unit ^{rotating at the speed} ~~rotating~~ with the rotation of the input shaft can be ^{spaced} ~~configured~~ apart,

and compared with the case wherein for example those units
are ~~configured~~ ⁱⁿ in contact with a multi-axial construction,
^a ~~the decreased~~ efficiency of the automatic transmission
resulting from the relative rotation between ^{these} ~~those~~ units can
be prevented.

^{In another preferred arrangement}
~~with the present invention according to Claim 13, the~~
first clutch ~~is configured~~ ⁵ ~~adjoined to~~ ^{first} the planetary gear
unit; ~~wherein the first clutch comprises a friction member,~~
^{2nd} ~~and an oil pressure servo that pressurizes this friction~~
^{a hydraulic} ~~member,~~ ^{causes the} ~~and a drum unit and a hub unit that are constructed~~
^{3, to engage}

1st clutch C2
the integral ~~with this oil pressure servo and wherein the~~ *In this preferred configuration*

2nd Embodiment Fig. 4
the drum unit is linked with the input shaft, and the hub unit is linked with the second ~~rotation component; and wherein~~ *rotary Further*
the second clutch is ~~configured on the opposite side in the~~ *as*
~~axial direction of the reducing planetary gear unit from the~~ *opposite speed second*
first clutch, ~~and wherein the second clutch comprises a~~ *Here also*
friction member and an oil pressure servo that ~~pressurizes~~ *causes the*
this friction member, ~~and a drum unit and a hub unit that~~ *to engage*

2nd clutch
are constructed ~~integrally with this oil pressure servo and~~ *hydraulic In such an*
embodiment ~~wherein the drum unit is linked with the input shaft, and~~ *as the second clutch*
the hub unit is linked with the third ~~rotation component,~~ *radially inward*
through the ~~outer circumference side of the first clutch.~~

Note: compare claim 13 reversed
The present invention ~~according to Claim 14 further~~ *may*
~~include~~ *fixing*
~~comprises a first brake capable of retaining rotations of~~ *against rotation*
the second rotation component, and a second brake capable of *for braking*
retaining rotations of the third rotation component, wherein *with*
the first brake is ~~configured on the outer circumference~~ *located radially outward*
side of the first clutch, ~~and wherein the second brake is~~ *located located radially outward first*
configured on the outer circumference side of the planetary gear unit.

The present invention ~~according to Claim 15 is~~ *includes*
configured with the first brake ~~comprising a friction member~~ *a hydraulic*
and an oil pressure servo that ~~pressurizes this~~ *causes engagement of the*
member, wherein the oil pressure servo of the first brake is *preferably*
~~located~~ *located*
~~configured at the outer circumference side in the radially~~

~~outward~~ ^{hydraulic}
~~direction of the oil pressure servo of the first clutch, at~~
a position ~~so as to overlap~~ ^{partially} at least a part in the axially overlapping same
~~direction, and wherein the friction member of the first~~
^{include plates splined} ~~intermeshed therewith, plates splined to~~
brake ~~is linked to the case and the hub unit of the first~~
clutch.

~~With the present invention according to Claim 16, the~~
^{Likewise}
~~second brake comprises a friction member and an oil pressure~~
^{includes} ~~servo that pressurizes this friction member, and the oil~~
^{controls engagement/disengagement of the}
~~pressure servo of the second brake is disposed on case~~
^{the hydraulic} ~~material extended so as to rotatably support the output~~
^{the case,} ~~member, and wherein the friction member of the second brake are~~
^{preferably formed in a portion of}
~~is disposed on the outer circumference side of the planetary~~
^{are preferably located radially outward}
~~gear unit.~~ ^{first}

~~With the present invention according to Claim 17,~~
~~transmitting member that links the reduced rotation~~
^{speed}
~~element second unit~~
~~component of the planetary gear or the third engaging~~
^{rotary element} ~~component and the first rotation component of the planetary~~
^{first}
~~gear unit is linked together while passing through the inner~~
^{said transmitting member including an axially extending portion}
~~circumference side of the output unit.~~ ^{radially inward}

^{automatic transmission of the}
~~The present invention according to Claim 18 further~~
^{may}
~~include~~
~~comprises a differential unit for outputting rotations to the~~
^{include}
~~driving wheels, and a counter shaft unit for engaging the~~
~~differential unit, wherein the output member is a counter~~
~~gear meshing with the counter shaft unit.~~

~~The present invention according to Claim 19 is~~

configured such that wherein, in a speed line chart illustrating the revolutions of the first, second, third, and fourth rotation components with the vertical axis, and the gear ratio of the first, second, third, and fourth rotation components with the horizontal axis in a corresponding manner; the first rotation component to which the reduced rotation is input is positioned at the farthest edge in the horizontal direction, with the fourth rotation component linked to the output member, the third rotation component, and the second rotation component, corresponding in that order.

In a preferred embodiment

~~With the present invention according to claim 20,~~ the *first* planetary gear unit is a multiple type planetary gear, comprising a first sun gear, a long pinion which meshes with the first sun gear, a short pinion which meshes with the long pinion, a carrier for rotationally supporting the long pinion and the short pinion, a second sun gear meshing with the short pinion, and a ring gear meshing with the long

In this preferred embodiment, ~~wherein the first rotation component is the second sun gear capable of inputting the reduced rotation of the reduced rotation output means~~ *which receives speed* ~~and wherein the second~~

~~rotation component is the first sun gear capable of~~ *which is rotatably* ~~inputting rotations of the input shaft by the engaging of~~ *driven by* ~~the first clutch, and which is capable of being fixed by the retaining of the first brake, and wherein the third rotation~~ *engaged with against rotation engagement*

^a component is the carrier ^{which receives} capable of inputting ^{of} the rotation ~~from~~ ^{upon} the input shaft by the engaging ^{ement} of the second clutch, and which is ^{against rotation} capable of being fixed by the retaining ^{engagement} of a second brake ³ and wherein the fourth rotation ^{of} component is ^a the ring gear linked to the output member.

^{In the preferred embodiment described immediately}
~~The present invention according to Claim 21 is~~
^{above}
~~configured wherein, in the first speed forward, reduced speed~~
rotation is input to the first rotation ^{of} component from the ^{speed} reduced rotation output means, and the second brake is engaged, retained; and wherein, ~~In the~~ ^{In the} second speed forward, reduced ^{speed} rotation is input to the first rotation ^{of} component from the reduced rotation output means, and the first brake is engaged, retained; and wherein, ~~In the~~ ^{In the} third speed forward, reduced ^{speed} rotation is input to the first rotation ^{of} component from the reduced rotation output means, and the first clutch is engaged, and wherein, ~~In the~~ ^{In the} fourth speed forward, reduced ^{speed} rotation is input to the first rotation ^{of} component from the reduced rotation output means, and the second clutch is engaged, and wherein, ~~In the~~ ^{In the} fifth speed forward, the first clutch and the second clutch are both engaged, and wherein, ^{and first brake are} in the sixth speed forward, the second clutch is engaged, and the first brake is retained; and wherein, ^{and second brake are} ~~In the~~ first speed reverse, the first clutch is engaged and the second brake is retained; whereby six forward speed ~~levels~~ ^{are provided} and one reverse speed level can be achieved.

Brief Description of the Drawings

Fig. 1 is a schematic cross-sectional ^{view} ~~diagram~~
~~illustrating an automatic transmission device of an~~
automatic transmission ^{according} ~~relating to a first embodiment;~~ ^{of the present invention} Fig.
2 is a ⁵ ~~operational~~ ^{for the} table of an automatic transmission
^{of} ~~relating to the first embodiment;~~ Fig. 3 is a speed line
diagram ^{for the} ~~of~~ ^{of} an automatic transmission ~~relating to the first~~
embodiment; Fig. 4 is a schematic cross-sectional ^{view} ~~diagram~~
~~illustrating an automatic transmission device of an~~ ^{of the present invention}
automatic transmission ^{according} ~~relating to a second embodiment;~~ ^{of} Fig.
5 is a schematic cross-sectional ~~diagram illustrating an~~
~~automatic transmission device of an automatic transmission~~
^{according} ~~relating to a third embodiment;~~ ^{of the present invention} ^{Table of} ⁵ Fig. 6 is a ^{operational}
~~table of an automatic transmission relating to the third~~
embodiment; Fig. 7 is a speed line diagram ^{for} ~~of an automatic~~
transmission ^{according} ~~relating to the third embodiment;~~ ^{of} Fig. 8 is a
schematic cross-sectional ^{view} ~~diagram illustrating an automatic~~
~~transmission device of an automatic transmission~~ ^{according} ~~relating to~~
^{of the invention} ^{of} a fourth embodiment; Fig. 9 is a schematic cross-sectional
^{view of} ~~diagram illustrating an automatic transmission device of an~~
automatic transmission ^{according} ~~relating to a fifth embodiment;~~ ^{of} Fig.
10 is a schematic cross-sectional ^{view} ~~diagram illustrating an~~
~~automatic transmission device of an automatic transmission~~
^{according} ~~relating to a sixth embodiment;~~ ^{Table of} ⁵ Fig. 11 is a ^{operational}

✓

~~table~~^{for} of an automatic transmission ~~relating~~^{according} to the sixth embodiment; and ~~Fig. 12~~^{is} is a speed line diagram ~~of an~~^{for the} automatic transmission ~~relating to~~^{of} the sixth embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

~~Best Mode for Carrying Out the Invention~~

~~First Embodiment~~

~~The~~^A first embodiment ~~relating to~~^{is} the present invention will be described, ~~following~~^{with reference to} Fig. 1 through Fig. 3, below.

Fig. 1 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the first embodiment, Fig. 2 is a operational table of an automatic transmission relating to the first embodiment, and Fig. 3 is a speed line diagram of an automatic transmission relating to the first embodiment.

~~An~~^{The} automatic transmission ~~relating to~~^{1, of} the first embodiment ~~according to~~^{of} the present invention, ~~has an~~ automatic transmission device 1, as illustrated in Fig. 1, ~~this~~^{is particularly useful} is particularly favorable for FF (front engine, front wheel drive) vehicle, and has a case comprising a housing case, ~~not illustrated, and a transmission case 3,~~ and within this housing case ~~is configured~~^{for} a torque converter, not illustrated, ~~within this~~^{and a} transmission case 3 ~~is configured an~~^{housing} automatic transmission device 1, a counter shaft unit (drive wheel transmission mechanism), not illustrated, and a differential unit (drive wheel

transmission mechanism).

~~This~~ ^{the} torque converter is ^{located} ~~configured, for example,~~ on ^{SA} ~~the axis that is~~ centered on an input shaft 2 of the automatic transmission device 1₁, which is on the same axis as the output shaft of the engine (not illustrated), ~~and this automatic transmission device 1₁ is configured on the output shaft of this engine, in other words, the axis that is centered on the input shaft 2.~~ Further, the ~~above-mentioned~~ counter shaft unit ^{includes} ~~is configured on~~ a counter shaft (not illustrated) on an axis that is parallel to the input shaft 2, and the above-mentioned differential unit ~~is configured so as to~~ has a lateral axle, not illustrated, on an axis that is parallel to ^{the} ~~this~~ counter shaft.

~~Next, an automatic transmission device 1₁ of an~~ ¹⁵ ~~automatic transmission relating to the first embodiment will be described, with reference to Fig. 1.~~ As illustrated in Fig. 1, the automatic transmission ~~device 1₁~~ comprises a ^{first} planetary gear unit PU and a ^{second} planetary gear ^{unit} (reduced speed ^{unit} ~~rotation output means,~~ reducing planetary gear) PR on the ²⁰ input shaft 2. ^{The first} ~~This~~ planetary gear unit PU is a multiple-type planetary gear ^{unit}, which has a sun gear S2 (the second ^{rotary} rotation component), a carrier CR2 (the third ^{rotary} rotation component), a ring gear R3 (the fourth ^{rotary} rotation component), and a sun gear S3 (the first ^{rotary} rotation component), as the ²⁵ four ^{rotary} rotation components, wherein ^{the} carrier CR2 has a long

, pinion PL that meshes with a sun gear S2 and the ring gear R3, and a short pinion PS that meshes with the sun gear S3, and the pinions PL and PS ^{with} which are meshed ~~to~~ one another. Further, the ~~above~~ ^{second} ~~mentioned~~ ^{unit} planetary gear PR is a double pinion planetary gear ^{unit} that has a carrier CR1, wherein a pinion Pb is meshed with a ring gear R1 and a pinion Pa is meshed with a sun gear S1, ^{and the pinions Pa and Pb} which are meshed one to another.

~~On the above-mentioned input shaft 2 is provided a boss unit 3a that is extended on one edge of the case 3 and~~
10 ~~formed in sleeve form on this input shaft 2, and on this boss unit 3a is configured a multi-disc clutch C1 (reduced speed rotation output means, the third engaging component, the third clutch) comprising an oil pressure servo 11, a friction plate 71, and a drum-shaped member 21, that forms a~~
15 ~~clutch drum.~~

~~This oil pressure servo 11 is constructed from a piston unit b for pressurizing the friction plate 71, the drum-shaped member 21 that has a cylinder unit e, an oil chamber "a" which is formed by sealing between this piston unit b and this cylinder unit e with seal rings f and g, a return spring c that energizes this piston unit b towards this oil chamber "a", and a return plate d that absorbs the energy of this return spring c.~~

~~Now, for the following descriptions, each oil pressure servo shall be considered as being constructed similarly~~

with
from an oil chamber "a", a piston unit b, a return spring c,
a return plate d, a cylinder unit e, and seal rings f and g,
and as such, description thereof will be ^{not repeated} omitted.

The oil chamber "a" of ~~this oil pressure~~ ^{hydraulic} servo 11 is ^{in communication} with
1/ ~~linked to~~ an oil line 92 ⁱⁿ of the boss unit 3a, and this oil
5 line 92 is linked to an oil pressure control device not
illustrated. ~~In other words,~~ ^{Because the above-mentioned}
^{hydraulic} oil pressure servo 11 is ^{located} configured on the boss ~~unit~~ 3a, an
^{connection} oil line from the oil pressure control unit (not illustrated)
10 to the oil chamber "a" of the oil pressure servo 11 ~~is~~ ^{can be}
~~constructed~~ ^{formed} by one set of seal rings 80 ^{which form a} to seal between ~~this~~ ^{the}
~~boss unit 3a and the drum shaped member 21.~~ ^{clutch}

~~Further, the above-mentioned boss unit 3a is supported~~ ^{rotatably}
~~by the above-mentioned drum shaped member 21, so as to be~~
^{the clutch drum} Friction plates 71 ^{are splined to}
15/ ~~capable of rotating, and on the inner circumference side of~~ ^{the clutch drum}
~~the front edge of this drum shaped member 21 is configured~~ ^{as a section}

~~the friction plate 71 of the clutch C1 which is capable of~~
^{engaged/disengaged by hydraulic} engaging by the oil pressure servo 11 for the clutch C1, by
~~being splined. The inner circumference side of the friction~~
~~plate 71 of this clutch C1 is splined to the hub unit 31~~ ^{are intermeshed with friction plates}
~~where the ring gear R1 is formed, and this hub unit 31 is~~ ^{the outer surface of the ring gear R1}
^{which forms part of the} ^{which} supported by the boss ~~unit~~ 3a, ^{is} ~~so as to be capable of~~ ^{rotatably}

~~rotating. Further, the carrier CR1 has the pinion Pa and~~
~~the pinion Pb, the pinion Pb meshes with the above-mentioned~~ ^{which}
^{which} ring gear R1, and the pinion Pa meshes with the sun gear S1

, in turn,
which^V is connected to the input shaft 2. This carrier CR1 is secured to the boss ~~unit~~ 3a of the case 3 via a side plate, and the sun gear S1 is connected to the input shaft 2.

5 ~~Also, the drum shaped member 21 wherein the friction~~
~~is connected to one end of a~~
~~plate 71 of the above mentioned clutch C1 is splined to a~~
transmitting member (the reduced rotation output means) 30,
that transmits the rotation of the ring gear R1 when ~~this~~
clutch C1 is engaged, and ~~on the other side of this~~
~~transmitting member 30^V the sun gear S3 of the above-~~
mentioned^{first} planetary gear unit PU, ~~is connected~~

10 ~~On the other hand, on the other edge of the input shaft~~
~~2 (left side of diagram) a multi-disc clutch C3 (the second~~
~~clutch) is configured that comprises an oil pressure servo~~
13, ~~a friction plate 73, a drum shaped member 25 that forms~~
15 ~~a clutch drum, and a hub unit 26. Further, on the boss unit~~
~~3b that is elongated on the other side of the case 3, on the~~

~~opposite side from the above mentioned boss unit 3a, and is~~
~~forms a sleeve around~~ ~~2nd supports~~
~~provided on the input shaft 2 in sleeve form, is configured~~

a multi-disc clutch C2 (the first clutch) ~~comprising an oil~~
20 ~~pressure servo 12, a friction plate 72, a drum shaped member~~
~~23 that forms a clutch drum, and a hub unit 24. Further, on~~

~~the outer circumference side of this clutch C2 is configured~~
~~a multi-disc brake B2 comprising an oil pressure servo 15~~
and ~~a friction plate 75, such that at least a part thereof~~ ~~axially~~
overlaps the ~~oil pressure servo 12, in the axial direction.~~
~~hydraulic~~

The oil chamber "a" of ~~this oil pressure~~ ^{hydraulic} servo 13 ^{connects} is ~~linked to an oil line 2b formed on this above mentioned~~
~~input shaft 2, and this oil line 2b is linked through an oil~~ ^{connects with}
~~line 93 of the above mentioned boss unit 3b, and this oil~~ ⁱⁿ
~~line 93 is linked through~~ ^{in turn,} to an oil pressure control device,
not illustrated. In other words, ^{connection between the oil chamber "a"} the above mentioned oil
^{of hydraulic} pressure servo 13 ^{and} ~~has an oil line constructed from the oil~~
~~pressure control device, not illustrated, to the oil chamber~~ ^{is formed}
~~"a" of the oil pressure servo 13, by one set of seal rings~~
^{provide a} 82 that seal between the boss ~~unit~~ 3b of the case 3 and the
input shaft 2.

The oil chamber "a" of the above-mentioned oil pressure
servo 12 ^{connects} is ~~linked through to an oil line 94 of the above~~
~~mentioned boss unit 3b, and this oil line 94 is linked~~
^{connects with} through to the oil pressure control device, not illustrated.
^{the connection between the oil chamber "a" of hydraulic}
In other words, ^{and} ~~for the above mentioned oil pressure servo~~
12, ~~an oil line is constructed from the oil pressure control~~
^{is formed} device, not illustrated, ~~to the oil chamber "a" of the oil~~
~~pressure servo 12, by one set of seal rings 83 that seal~~ ^{provide a}
between the boss ~~unit~~ 3b of the case 3 and ^{an extension of clutch drum} the drum-shaped
member 23.

^{clutch drum}
The ~~drum shaped member~~ 25 of the ~~above mentioned~~ clutch
C3 is connected to the input shaft 2, and ^{splined to a} ~~on the front edge~~ ^{portion}
of the inner circumference ^{tial surface of clutch drum} ~~side of this drum shaped member~~
25 ^{are} ~~is configured a~~ friction plate ^s 73 of the clutch C3 that

are engaged/disengaged by hydraulic
is capable of engaging by the oil pressure servo 13, for the
clutch C3, by being splined. On the inner circumference
side of the friction plate 73 of this clutch C3 ~~are~~ ^{are} intermeshed with friction plates splined to
configured a hub unit 26 by being splined, and this hub unit
26 is connected to the carrier CR2.

~~The drum-shaped member 23 of the above-mentioned clutch~~
C2 is connected to the input shaft 2, and ~~on the front edge~~ ^{the}
~~of the inner circumference side of this drum-shaped member~~ ^{the surface of clutch drum}
23 ~~is configured a friction plate 72 of the clutch C2 that~~ ^{has} ~~is capable of engaging by the oil pressure servo 12, for the~~ ^{splined thereto which are}
clutch C2, by being splined. ~~On the inner circumference~~ ^{engaged/disengaged} ~~side of the friction plate 72 of this clutch C2~~ ^{hydraulic} ~~is are splined~~ ^{intermeshed with friction plates}
~~configured a hub unit 24, by being splined, and on the outer~~ ^{to} ~~circumference side of this hub unit 24 is configured by~~ ^{are intermeshed with friction plates splined to}
~~splining a friction plates 75 of the brake B2 that is capable~~ ^{the surface}
~~of engaging by the oil pressure servo 15 for the brake B2.~~ ^{and are engaged/disengaged by hydraulic}

Also, ^{also} This hub unit 24 is connected to the sun gear S2.

On the other hand, ^{radially} on the outer circumference side of
the planetary gear unit PU is ~~configured a multi-disc brake~~ ^(second brake) ~~B1 that comprises an oil pressure servo 14, // friction plates~~ ^{a hydraulic}
74, and a hub unit 28. ~~The oil pressure servo 14 is formed~~ ^{hydraulic}
~~disposed on a member extended from the case 3 for rotatably~~ ^{in extending radially inward} ~~supporting a later described counter gear 5. Also, to the~~ ^{and}
side plate of the carrier CR2 of this planetary gear unit PU
is connected ^{the first} ~~the hub unit 28 splined with the friction plates~~ ^{to which are} ~~meshing with friction plates~~

74 of the above-mentioned brake B1, ~~and further, this~~ hub unit 28 is connected to the inner race of a one-way clutch F1. The sun gear S3 is meshed with the short pinion PS of this carrier CR2, and the above-mentioned sun gear S2 and ring gear R3 are meshed with the long pinion PL of this carrier CR2. Also, a linking ~~unit~~ ^{member} 27 is connected to one ~~edge of this~~ ^{end} ring gear R3, and ~~this ring gear R3 is linked~~ ^{thereby links} to the counter gear (output unit) 5 ~~via this linking unit 27.~~

As described above, the ~~planetary gear~~ ^{second} PR and the clutch C1 are ~~configured on one side in the direction of the~~ ^{located at axial} ~~axis of the~~ ^{first} planetary gear unit PU, ~~and also the clutch C2~~ ^{whereas} and the clutch C3 are ~~configured on the other side, in the~~ ^{located axial} ~~direction of the axis.~~ Further, the counter gear 5 is ~~located~~ ^{located} ~~configured between the planetary gear~~ ^{second unit} PR and the ~~planetary~~ ^{first} gear unit PU, ~~in the direction of the axis.~~ Further, the ~~brake B2 is configured on the outer circumference side of~~ ^{located radially outward} the clutch C2, and the brake B1 is ~~configured on the outer~~ ^{located radially outward} ~~circumference side~~ ^{first} of the planetary gear unit PU.

~~Continuing, based on the above mentioned construction,~~
~~the~~ ^{with reference} operations of the automatic transmission ~~device~~ 1₁ will now be described, following Fig. 1, Fig. 2, and Fig. 3, ~~below.~~

~~Now,~~ The vertical axis ^e of the speed line diagram illustrated in Fig. 3 ~~indicate the revolutions of each rotation~~ ^{show speed of rotation} component, and the horizontal axis indicates the corresponding gear ratio of these ~~rotation~~ ^{rotary} components.

Further, ⁱⁿ ~~regarding~~ the planetary gear unit PU section of this speed line diagram, the vertical axis ^{at} ~~to the farthest horizontal edge~~ ~~the right side of Fig. 3~~ corresponds to the sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axis ^a ~~corresponds~~ ^{successively,} to the ring gear R3, the carrier CR2, and the sun gear S2. ~~Further,~~

^{In} ~~regarding~~ the planetary gear PR section of this speed line diagram, ^(right section in Fig. 3) the vertical axis to the farthest ~~horizontal edge~~ ~~the right side of Fig. 3~~ corresponds to the sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axis ^e ~~corresponds~~ ^{successively,} to the ring gear R1 and the carrier CR1. Further, the width between these vertical axes are ^{inversely} ~~proportional~~ to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to ~~the~~ ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. Also, ^{the} ~~the~~ dotted line ^{represents} ~~in a horizontal direction within the diagram illustrate that~~ the rotation ~~is~~ transmitted from the transmitting member 30.

As illustrated in Fig. 1, the rotation of the input shaft 2 is input to the ~~above-mentioned~~ sun gear S2, by engaging the clutch C2, and the rotation of this sun gear S2 ^{can be stopped (braked)} ~~is capable of being fixed~~ by ^{engagement} ~~retaining~~ of the brake B2. ^("first brake") The rotation of the input shaft 2 is input to the ~~above-mentioned~~ carrier CR2, by engaging the clutch C3, and this carrier CR2 can ^{held & against} ~~fix the~~ rotation by ^{engagement} ~~the retaining~~ of the

is limited to
brake B2, and further, the rotation ~~in~~ in one direction ~~is~~
~~regulated~~ by a one-way clutch F3.

~~On the other hand,~~ The above-mentioned sun gear S1 is
and receives input of rotation from
connected to the input shaft 2, and the rotation of this
~~input shaft 2 is input, and further,~~ The carrier CR1 is
~~fixed~~
connected to the case 3 and the rotation thereof is fixed,
and, therefore, the ring gear R1 rotates at a reduced speed.
Further, by engaging the clutch C1, the reduced rotation of
this ring gear R1 is input to the sun gear S3. Also, The
rotation of the ~~above-mentioned~~ ring gear R3 is output to
the ~~above-mentioned~~ counter gear 5, and ~~is output~~ from the counter gear 5
to the drive wheel^s, not illustrated, via this counter gear 5, a
counter shaft unit not illustrated, and a differential unit.

~~In~~ In first speed forward within ~~the~~ D (drive) range, as
illustrated in Fig. 2, the clutch C1 and the one-way clutch
F1 are engaged. Then, as illustrated in Fig. 3, the reduced speed
rotation of the ring gear R1 is input to the sun gear S3 via
the clutch C1 and the transmitting member 30. Further, the
rotation of the carrier CR2 is ~~controlled~~ limited to in one direction
(the forward rotation direction) by the one-way clutch F1.
~~in other words the carrier CR2 is prevented from rotating in~~
~~the opposite direction and is fixed.~~ Then, The ring gear R3
rotates ~~at~~ in the forward rotation for the first speed forward,
with speed
from the reduced rotation input to the sun gear S3 and the
fixed carrier CR2, and that rotation is output from the

counter gear 5.

~~Now, when~~ ^{For} downshifting (when coasting), the brake B1 is ^{engaged to fix} ~~retained~~ and the carrier CR2 ~~is fixed~~, and the ~~above~~ ^{mentioned} state of first speed forward is maintained while preventing ~~the~~ ⁱⁿ forward rotation of this carrier CR2.

Further, ~~at this~~ ⁱⁿ first speed forward, the one-way clutch F1 prevents the carrier CR2 from rotation in the ~~opposite~~ ^{reverse} direction ~~and allows~~ ^{while allowing} forward rotation, and therefore, switching from a non-running range to a running range and achieving the first speed forward can be accomplished more smoothly by the automatic engaging of the one-way clutch.

In this case, because the sun gear S3 and the ring gear R1 ^{rotating} are at a ~~reduced rotation~~ ^{speed}, the above-mentioned transmitting member 30 ^{transmits} ~~performs~~ a relatively large torque, ~~transmission~~.

~~In~~ ^{At} second speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C1 ~~is engaged~~ and the brake B2 ~~is retained~~ ^{are engaged}. Then, as illustrated in Fig. 3, the ~~reduced rotation~~ ^{speed} of the ring gear R1 is input to the sun gear S3 via the clutch C1 and the transmitting member 30, and the rotation of the sun gear S2 is ~~fixed~~ ^{stopped} by the brake B2.

By doing so, the carrier CR2 rotates at ^a slightly reduced ^{speed} ~~rotation~~, and from the reduced ^{speed} rotation input to the sun gear S3 and this slightly reduced ^{speed} rotation of the carrier CR2, the ring gear R3 ^{is} ~~rotated~~ ^{with} the forward rotation for the second speed forward, and this rotation is output to the

counter gear 5. ~~Now, also in this case,~~ ^{Because} the sun gear S3 and the ring gear R1 are ^{rotating} at a ^{speed} reduced rotation, the above-mentioned transmitting member 30 ^{transmits} performs a relatively large torque. ~~transmission.~~

^{In} ~~At~~ third speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C1 and the clutch C2 are engaged. Then, as illustrated in Fig. 3, the reduced ^{speed} rotation of the ring gear R1 is input to the sun gear S3 via the clutch C1 and the transmitting member 30, and also the rotation of the input shaft 2 is input to the sun gear S2 by engaging the clutch C2. Further, by the rotation of the input shaft 2 input to the sun gear S2 and by the decreased ^{speed} rotation of the sun gear S3, the ^{speed of rotation of} ~~fixed~~ carrier CR2 ^{is reduced} has a ^{to a} ~~slightly larger reduced rotation~~ ^{extent} than the reduced ^{rotation in} rotational speed of this sun gear S3. Further, from the input rotation of the sun gear S2 and the reduced ^{speed} rotation of the sun gear S3, the ring gear R3 ^{is} rotated ^{with} at the forward rotation ^{of} for third speed forward, and this rotation is output from the counter gear 5. In this case also, because the sun gear S3 and the ring gear R1 are ^{rotating} at a ^{speed} reduced rotation, the above-mentioned transmitting member 30 ^{transmits} performs a relatively large torque.


~~transmission.~~

^{In} ~~At~~ fourth speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C1 and the clutch C3 are engaged. Then, as illustrated in Fig. 3, the reduced

^{speed}
Rotation of the ring gear R1 is input to the sun gear S3 via the clutch C1 and the transmitting member 30, and also the rotation of the input shaft 2 is input to the carrier CR2 via the clutch C3. Then, by the rotation of input shaft 2 input to the carrier CR2 and by the reduced ^{speed} rotation of the sun gear S3, the ring gear R3 ^{is} rotated ^{with} at the forward rotation ^{of} for fourth speed forward, and this rotation is output from the counter gear 5. In this case also, because the sun gear S3 and the ring gear R1 are ^{rotating} at a reduced ^{speed} rotation, the ~~above-mentioned~~ transmitting member 30 ^{transmits} performs a relatively large torque, ~~transmission~~.

^{In}
At fifth speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C2 and the clutch C3 are engaged. Then, as illustrated in Fig. 3, the rotation of input shaft 2 is input to the carrier CR2 via the clutch C3, and also the rotation of the input shaft 2 is input to the sun gear S2 via the clutch C2. Then, from the rotation of the input shaft 2 input to the sun gear S2, and the rotation of the input shaft 2 input to the carrier CR2, the ring gear R3 becomes a direct ^{as} connect ~~rotation~~ and rotates ^{with the} at the forward rotation ^{of} for fifth speed forward which ^{is at} has the same ^{speed} rotation ^{that of} as the input shaft 2, and this rotation is output from the counter gear 5.

^{In}
At sixth speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C3 ~~is engaged~~ and the



brake B2 ~~is retained~~ ^{are engaged}. Then, as illustrated in Fig. 3, the rotation of the input shaft 2 is input to the carrier CR2 via the clutch C3, and rotation of the sun gear S2 is fixed by ~~retaining~~ ^{engagement} of the brake B2. Then, from the rotation of the input shaft 2 input to the carrier CR2 ~~and from the~~ ^{with} ~~fixed sun gear S2~~ ^{with}, the ring gear R3 rotates ~~at~~ ^{of} the overdrive rotation for sixth speed forward, and this rotation is output from the counter gear 5.

~~In~~ ^{In} first speed reverse within ~~an~~ R (reverse) range, as illustrated in Fig. 2, the clutch C2 ~~is engaged~~ and the brake B1 ~~is retained~~ ^{are engaged}. Then, as illustrated in Fig. 3, the rotation of the input shaft 2 is input to the sun gear S2 by engaging the clutch C2, and also the rotation of the carrier CR2 is fixed by ~~retaining~~ ^{engagement of} the brake B1. Then, from the rotation of the input shaft 2 input to the sun gear S2 and ~~from the fixed~~ ^{ing of the} carrier CR2, the ring gear R3 rotates in the opposite direction ^{s.e.} as ~~the~~ first speed reverse, and this rotation is output from the counter gear 5.

~~In~~ ^{In} the P (parking) range and the N (neutral) range, ~~particularly~~ the clutch C1, clutch C2, and clutch C3 are released, the transmission ~~movement~~ ^{of rotation} between the input shaft 2 and the counter gear 5 is disconnected, and the automatic transmission ~~device~~ 1₁ as a whole is in an idle state (neutral state).

As described above, ~~according to~~ ⁱⁿ the automatic



transmission ~~device~~ ^{of} 1, relating ~~to~~ the present invention,
the planetary gear PR and the clutch C1 are ~~configured~~ ^{located} on
~~one side in the axial direction~~ ^{axial} of the planetary gear unit
PU, and the clutch C2 and the clutch C3 are ~~configured~~ ^{located} on
~~the other side in the axial direction~~ ^{axial} of the planetary gear
unit PU. Therefore, an automatic transmission ~~can be~~ ^{is} provided
that will achieve six forward speeds and one reverse speed
with direct coupling ⁱⁿ at fifth speed forward. For example,
compared to the case wherein the clutch C2 or clutch C3 is
~~configured~~ ^{located} between the ^{second} planetary gear PR and the ^{first} planetary
gear unit PU, the ^{second} planetary gear PR and the ^{first} planetary gear
unit PU can be ~~configured~~ ^{located} close together, and the
transmitting member 30 ~~for transmitting~~ ^{which} the reduced ^{speed} rotation
can be made relatively short. Therefore, the automatic
transmission can be made ^{more} compact and lightweight, and
further, because the inertia (force ~~of~~ inertia) can be
reduced, the controllability of the automatic transmission
can be improved, and the occurrence of speed change shock
can be reduced.

Further, the clutch C1 is ~~configured~~ ^{located} on one ^{axial} side ~~in the~~
~~axial direction~~ ^{first} of the planetary gear unit PU, and the
clutch C2 and the clutch C3 are ~~configured~~ ^{located} on the other ^{axial} side
~~in the axial direction~~ ^{first} of the planetary gear unit PU, and
therefore, compared to the case wherein, ~~for example, the~~
three clutches C1, C2, C3 are ~~configured~~ ^{located} on one ^{axial} side of the

^{first} planetary gear unit PU, the construction of an oil line (for example, 2b, 92, 93, 94) ^{for} to provide ^{ing} pressure ^{hydraulic} oil to the oil pressure servos 11, 12, and 13 for these clutches C1, C2, and C3 can be made easily, and the manufacturing process can be simplified and the costs brought down.

Further, because the ^{hydraulic} oil pressure servo 13 is ^{mounted} provided on the input shaft 2, one set of the seal rings 82 ^{form 2} seal the case 3 and ~~supply oil to~~ the oil line 2b provided within the input shaft 2, and therefore oil can be supplied to the oil chamber "a" of the oil pressure servo 13 without providing ^{addition 2/} seal rings between, for example, the input shaft 2 and the ^{hydraulic} oil pressure servo 13. Further, the ^{hydraulic} oil pressure servos 11 and 12 can each ^{receive of directly} supply oil from the boss ^{es} units 3a and 3b ^{i.e.} provided from the case 3, without passing through other units, for example, ^{In} other words, ~~can supply oil by~~ providing one set of seal rings 80 and 83. Therefore, oil can be supplied simply by providing one set of seal rings 82, 80, and 83 each for the oil pressure servos 11, 12, and 13, and sliding resistance from the seal rings can be minimized, and therefore, the efficiency of the automatic transmission can be improved.

Further, since ~~the~~ clutch C2 is ~~a clutch that~~ engaged ⁱⁿ while at first speed reverse, when this clutch 2 is engaged at first speed reverse, the transmitting member 30 rotates in a reverse ~~rotation~~, and while the hub unit 24 that

connects this clutch C2 and the sun gear S2 has the same rotation ^{at speed} as the input shaft 2, ~~by engaging this clutch C2,~~ there may be cases wherein the ^{at} ~~rotation difference~~ ^{speeds between} of the transmitting member 30 and the hub unit 24 becomes large, but because ~~this~~ clutch C2 is located on the opposite side ~~of~~ ^{opposite second unit} of the planetary gear PR, ~~via~~ ^{first} the planetary gear unit PU,

the transmitting member 30 and the hub unit 24 can be ~~located~~ ^{located} apart from one another. Compared to the case wherein, for example, those parts come in contact due to a multi-axial construction, the ~~decreased~~ ^{loss of} efficiency of the automatic transmission caused by the friction produced by the relative rotation between those parts can be prevented.

Further, because the counter gear 5 is ~~configured in~~ ^{located} the axial ~~direction~~ between the planetary gear unit PU and the planetary gear PR, the counter gear 5 can be ~~configured~~ ^{located} in approximately the ~~center in the axial direction~~ of the automatic transmission. For example, when the automatic transmission is mounted ^{at} on the vehicle, enlarging ^{ment} towards ~~one direction of the axis (particularly in the rear direction)~~ (when the input side from the drive source is the front direction) can be prevented because the counter gear 5 is mounted to ^{mate with} ~~match~~ the drive wheel transmission mechanism. Because of this, particularly in the case of an FF vehicle, the interference ^{with} ~~toward~~ the front wheels is reduced, and the mountability on a vehicle can be improved, ~~such~~ the steering

¹⁵
angle ~~being~~ greatly improved, for example.

~~Because~~
~~Further, the automatic transmission device 1, according~~
~~to the present embodiment is a transmission device that is~~
directly coupled ⁱⁿ at fifth speed forward, ~~Therefore, at~~
first speed forward or fourth speed forward, the gear ratio
can be ~~specified in a detailed manner, and particularly when~~
~~mounted on a vehicle, in the event that the vehicle is~~
running at a high speed, the engine can be ~~utilized with~~
^{operated at a}
~~better revolutions,~~ ^{lower speed} and this contributes to increased fuel
economy of the vehicle while running at a low to medium
speed.

✓ Second Embodiment

The second embodiment, which is a partial modification
of the first embodiment, will be described ~~with~~ with reference to
Fig. 4. ~~Fig. 4 is a schematic cross-sectional diagram~~
~~illustrating the automatic transmission device of an~~
~~automatic transmission relating to the second embodiment.~~
~~Now,~~ Components of the second embodiment which are the same
as those of the first embodiment ^{are} ~~will be~~ ^{by} denoted with the
same reference numerals, and description thereof omitted,
except for ^{those components which are modified.} ~~partial modifications.~~

As Fig. 4 illustrates, the automatic transmission
~~device 1₂ of the automatic transmission relating to the~~
second embodiment has the input side and output side
^{reversed}
~~backwards~~ from that of the automatic transmission device 1,

~~of the automatic transmission~~ of the first embodiment (see Fig. 1). Further, the ^{operations} ~~actions~~ of the first speed forward through the sixth speed forward and the first speed reverse ^{are} ~~is~~ similar (see Fig. 2 and Fig. 3).


Accordingly, ~~and~~ similar to the first embodiment, ⁱⁿ ~~according to~~ the automatic transmission device 12 ^{of the second embodiment} ~~relating~~ ~~to the present invention~~, the planetary gear ^{unit} ~~PR~~ and the clutch C1 are ^{located} ~~configured~~ on one ^{axial} ~~side in the axial~~ direction of the ^{first} ~~planetary gear unit~~ PU, and the clutch C2 and the clutch C3 are ^{located} ~~configured~~ on the other ^{first} ~~side in the axial~~ ~~direction~~ of the planetary gear unit PU, and therefore directly coupled when at fifth speed forward, and can achieve six forward speeds and one reverse speed. ^{In this second embodiment 2/30,} ~~The second~~ planetary gear ^{unit} ~~PR~~ and the ^{first} ~~planetary gear unit~~ PU can be ^{located} ~~configured~~ closer together, compared to the case wherein, for example, the clutch C2 and the clutch C3 are ^{located} ~~configured~~ between the planetary gear PR and the planetary gear unit PU, and the transmitting member 30 ^{which} ~~for transmitting~~ the reduced ^{speed} rotation can be made relatively short. Therefore, the automatic transmission can be made compact and lightweight, and further, because the inertia ~~(force of inertia)~~ can be reduced, the controllability of the automatic transmission can be improved, and the occurrence of speed change shock can be reduced.

Further, the clutch C1 is ^{located} ~~configured~~ on one ^{axial} ~~side in the~~

~~axial direction~~ of the planetary gear unit PU, and the
clutch C2 and the clutch C3 are ^{located} ~~configured~~ on the other ^{axial} side
~~in the axial direction~~ of the ^{first} planetary gear unit PU, and

therefore, compared to the case wherein, for example, the
three clutches C1, C2, and C3 are ^{located} ~~configured~~ on one side of
the ^{first} planetary gear unit PU, the ~~construction of an~~ oil line
(for example, 2b, 92, 93, 94) ^{for} ~~to provide~~ ^{ing} oil to the ^{hydraulic} oil
~~pressure~~ ^{operating} servos 11, 12, and 13 for these clutches C1, C2,
and C3 can be ^{constructed} ~~made~~ easily, ^{i.e.} and the manufacturing process ^{is} ~~can~~
~~be~~ simplified and the costs ^{reduced} ~~brought down~~.

Further, because the ^{hydraulic} ~~oil pressure~~ servo 13 is provided
on the input shaft 2, one set of the seal rings 82 ^{form} ~~seal~~ the
~~case 3~~ ^{connection of oil line 93 in boss 3b} and supply oil to the oil line 2b provided within
input shaft 2, and therefore oil can be supplied to the oil
chamber "a" of the oil pressure servo 13 without providing
seal rings between, for example, the input shaft 2 and the
^{hydraulic} ~~oil pressure~~ servo 13. Further, the ^{hydraulic} ~~oil pressure~~ servos 11
and 12 can each ^{receive of directly} supply oil from the boss units 3a and 3b
provided from the case 3, ^{i.e.} without passing through other
units. ~~for example,~~ ^{their} In other words, ^{of} can supply oil by ^{can be secured}
providing one set of ~~the~~ seal rings 80 and 83. Therefore,
oil can be supplied simply by providing one set of ~~the~~ seal
rings 82, 80, and 83 each for the oil pressure servos 11, 12,
and 13, ~~and~~ sliding resistance from the seal rings can be
minimized, and therefore the efficiency of the automatic



transmission can be improved.

Further, ~~since the clutch C2 is a clutch that engaged~~
~~while at first speed reverse, when this clutch is engaged~~
~~in first speed reverse, the case may occur wherein the~~
~~transmitting member 30 rotates in a reverse rotation and~~
~~the other hand the hub unit 24 that connects this clutch C2~~
~~and the sun gear S2 has the same rotation as the input shaft~~
~~2, by engaging this clutch C2, and there may be cases wherein~~
~~the rotation difference of the transmitting member 30 and~~
~~the hub unit 24 becomes large, but because this clutch C2 is~~
~~located on the opposite side of the planetary gear PR, and~~
~~side of the planetary gear unit PU, the transmitting member 30 and~~
~~the hub unit 24 can be configured apart from one another.~~
with C2
re may be a large difference in rotational speed
which
and which
However,
second unit
located

Compared to the case wherein, for example, those parts come in contact due to a multi-axial construction, the decreased efficiency of the automatic transmission caused by the friction produced by the relative rotation between those parts can be prevented.

Further, because the counter gear 5 is ~~configured in~~
~~the axial direction between the planetary gear unit PU and~~
~~the planetary gear PR, the counter gear 5 can be configured~~
~~in approximately the center in the axial direction of the~~
~~automatic transmission. For example, when the automatic~~
~~transmission is mounted on the vehicle, enlarging towards~~
~~one direction of the axis (particularly in the rear~~
located
first
second unit
located
ment

~~direction~~ (when the input side from the drive source is the front ~~direction~~) ^{is not required} ~~can be prevented~~ because the counter gear 5 is mounted to ^{mate with} ~~match~~ the drive wheel transmission mechanism. Because of this, particularly in the case of an FF vehicle, the interference ^{with} ~~toward~~ the front wheels is reduced, ~~and~~ the mountability on a vehicle ^{is} ~~can be~~ improved, ^{and} ~~such~~ the steering angle ^{is} ~~being~~ greatly improved, ~~for example.~~

Further, the automatic transmission ~~device~~ 1₂ according to the ^{second} ~~present~~ embodiment is ~~a transmission device that is~~ directly coupled ⁱⁿ ~~at~~ fifth speed forward. Therefore, ⁱⁿ ~~at~~ first speed forward or fourth speed forward, the gear ratio can be ^{set more precisely} ~~specified in a detailed manner~~, and particularly when ~~mounted on a vehicle, in the event that the vehicle is~~ running at a high speed, the engine can be ^{operated at lower} ~~utilized with~~ ^{speeds} ~~better revolutions~~, and this contributes to increased fuel economy of the vehicle while running at a low to medium speed.

~~Third Embodiment~~

The third embodiment, which is a partial modification of the first embodiment will ^{now} ~~be~~ described ~~with~~ with reference to Fig. 5 through Fig. 7. ~~Fig. 5 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the third embodiment, Fig. 6 is a operational table of an automatic transmission relating to the third embodiment, and Fig. 7 is~~

~~a speed line diagram of an automatic transmission relating to the third embodiment~~ Now, Components of the third embodiment which are the same as those of the first embodiment ^{are} ~~will be~~ ^{by} denoted with the same reference numerals, and description thereof omitted, except for partially ^{components which are} ~~modified~~ ^{ed}.

As Fig. 5 illustrates, the automatic transmission device 1₃ of the ~~automatic transmission relating to the~~ third embodiment has a modified ~~configuration of the~~ planetary gear ^{unit modified} PR and ~~the~~ clutch C1, and further, a modified ~~construction of the oil line of the oil pressure servo 11 of~~ ^{for supplying to hydraulic} the clutch C1, ^{as} compared to ~~that of~~ the automatic transmission device 1₁ of the ~~automatic transmission of the~~ first embodiment (see Fig. 1).

Within the automatic transmission device 1₃, the clutch C1 is ^{located} ~~configured~~ on the ^{side of the} planetary gear ^{unit} PR, ~~on the~~ opposite side ~~(right side on the diagram) from~~ the planetary gear unit PU. The ~~front edge of the inner circumference side of~~ ^{the} drum-shaped member 21 of ~~the~~ clutch C1 is splined to the friction plate 71, and the ~~inner circumference side of~~ ^{which are intermeshed with friction plates} this friction plate 71 ~~is~~ splined to the hub unit 22. The drum-shaped member 21 is connected to the input shaft 2, and the hub unit 22 is connected to the sun gear S1 of the ^{second} planetary gear ^{unit} PR. The side plate of the carrier CR1 of this planetary gear PR is ^{to} fixed and supported by the case 3.

Also, the ring gear R1 is connected to the transmitting member 30, and this transmitting member 30 is connected to the sun gear S3. In other words, the ring gear R1 and the sun gear S3 are constantly ^{connected} ~~in contact~~ with one another, ~~for~~ ^{there} ~~example~~ with no clutch located between, and ~~the~~ rotation can constantly be transmitted.

The oil compartment of this oil pressure servo 11 is linked to an oil line 2a which is formed ⁱⁿ ~~on~~ the input shaft 2, and this oil line 2a is ~~provided along one edge of the case 3, and is~~ connected to the oil line 91 ⁱⁿ ~~of~~ the boss ~~unit~~ ^{surrounds} 3a which ~~is provided on~~ the input shaft 2 in ^{the} ~~sleeve~~ ^{of 3} form, and this oil line 91 is linked to an oil pressure control unit not illustrated. Therefore, ~~regarding the above mentioned oil pressure servo 11,~~ simply by providing one set of the seal rings 81 to ^{form} seal between the input shaft 2 and the boss ~~unit~~ 3a ~~of the case 3,~~ an oil line is ^{established} ~~constructed~~ ^{between} from the oil pressure control device (not illustrated) and the oil compartment of the ^{hydraulic} ~~oil pressure~~ servo 11.

~~Continuing, based on the above mentioned construction,~~ ^{of the third embodiment}
Q1 The operations of the automatic transmission device 13 ^{will} ~~now~~ be described ^{with reference to} following Fig. 5, Fig. 6, and Fig. 7, ~~below~~.

~~Now,~~ Similar to the above-described first embodiment, the vertical ^{axes} ~~axis~~ of the speed line diagram illustrated in Fig. 7 indicates ^{rotational speeds} ~~the revolutions~~ of each ^{rotary} ~~rotation~~ component, and the horizontal axis indicates the corresponding gear ratio.

of these ^{rotary} ~~rotation~~ components. Further, ⁱⁿ ~~regarding~~ the planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the right side of~~ ⁱⁿ Fig. 7 ~~1~~ corresponds to the sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ^{axes} ~~axis~~ corresponds ~~to~~ to the ring gear R3, the carrier CR2, and the sun gear S2. Further, ⁱⁿ ~~regarding~~ the ^{unit} ~~second~~ planetary gear ^{the} ~~PR~~ section of ~~this~~ speed line diagram, the vertical axis to the farthest ~~horizontal edge (the right side of~~ ⁱⁿ Fig. 7 ~~2~~ corresponds to the sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ^{axes} ~~axis~~ corresponds ~~to~~ to the ring gear R1 and the carrier CR1. Further, the ^{in succession} ~~width~~ ^{distances} between these vertical axes are ^{proportional to the inverse of} ~~proportional to the inverse of~~ the number of teeth of each of the sun gears S1, S2, S3, and to the ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. Also, the dotted line ^{represents} ~~in a horizontal direction~~ within the diagram ~~illustrate that~~ the rotation ^{is} ~~is~~ transmitted ^{by} ~~from~~ the transmitting member 30.

As illustrated in Fig. 5, by engaging the clutch C1, the rotation of the input shaft 2 is input to the sun gear S1. Further, the rotation of the above-mentioned carrier CR1 is fixed to the case 3, and the ^{is rotated at a} ~~above-mentioned~~ ring gear R1 ^{decreased} ~~speed rotation~~ based on the rotation of the input shaft 2 input to ~~this~~ sun gear S1. In other words,

by engaging the clutch C1, the reduced ^{speed} rotation of the ring gear R1 is input to the sun gear S3 via the transmitting member 30.

Then, as illustrated in Fig. 6 and Fig. 7, within the ^{second} planetary gear ^{unit} PR, ⁱⁿ at first speed forward, second speed forward, third speed forward, and fourth speed forward, the rotation of the input shaft 2 is input to the sun gear S1 by engaging the clutch C1, ~~the~~ ^{speed} reduced rotation is output to the ring gear R3 from the fixed carrier CR1, and the reduced ^{speed} rotation is input to the sun gear S3 via the transmitting member 30. At this time, the ring gear R1 and the sun gear S3 are rotating at a reduced speed, and therefore the ~~above~~ ^{transmits} mentioned transmitting member 30 ~~performs~~ a relatively large torque ~~transmission~~. On the other hand, ⁱⁿ at fifth speed forward, sixth speed forward, and first speed reverse, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 30, and further, because the clutch C1 is released, as illustrated in Fig. 7, the sun gear S1 rotates based on ~~each different~~ ^{the} speed level ^{of the} of this ring gear R1 and ~~the fixed~~ ^{fixing of the} carrier CR1.

~~Now,~~ ^{operations} the actions of the ~~above mentioned~~ planetary gearing ^{are} similar to those of the ~~above described~~ first embodiment, ^{other than those of} ~~except for~~ the ^{second} ~~above-described~~ planetary gear ^{unit} PR (see Fig. 2 and Fig. 3), and accordingly, description thereof will be omitted.

As described above, ⁱⁿ ~~according to the automatic~~ ^{of the third embodiment} transmission device 13 ~~relating to the present invention,~~ ^{located} the planetary gear PR and the clutch C1 are ~~configured~~ ^{first} on one ~~side in the axial~~ ^{located} direction of the planetary gear unit PU, and the clutch C2 and the clutch C3 are ~~configured~~ ^{first} on the other ~~side in the axial~~ ^{located} direction of the planetary gear unit PU. Therefore, ^{the} ~~an~~ automatic transmission can be ^{of the third embodiment} ~~provided that~~ will achieve six forward speeds and one reverse speed, with direct coupling at the fifth speed forward. For example, compared to the case wherein the clutch C2 or clutch C3 is ~~configured~~ ^{located} between the ^{second} planetary gear ^{unit} PR and the ^{first} planetary gear unit PU, ^{second} the planetary gear unit PR and the planetary gear unit PU can be ~~configured~~ ^{located} closer together, and the transmitting member 30 ^{which} ~~for~~ transmitting the reduced ^{speed} rotation can be made relatively shorter. Therefore, the automatic transmission ^{of the third embodiment} can be made ^{more} compact and lightweight, and further, because the inertia ^{inertial} (force ~~of~~) ~~inertia~~) can be reduced, the controllability of the automatic transmission can be improved, and the occurrence of speed change shock can be reduced.


Further, the clutch C1 is ~~configured~~ ^{axial} on one ^{first} side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C2 and the clutch C3 are ~~configured~~ ^{located} on the other ^{axial} side ~~in the axial direction~~ of the planetary gear unit PU, and therefore, compared to the case wherein, for example, the

three clutches C1, C2, and C3 are ~~configured~~ ^{located} on one side of the planetary gear unit PU, the construction of an oil line (for example, 2a, 2b, 91, 93, 94) ~~to provide oil to the oil pressure servos 11, 12, and 13 for these clutches C1, C2, and C3 can be made~~ ^{for providing to the hydraulic} ~~easily, and the manufacturing process can be simplified, and the costs brought down.~~ ^{more} ~~brought down.~~ ^{can be reduced.}

Further, because the ~~oil pressure~~ ^{hydraulic} servos 11 and 13 are provided on the input shaft 2, one set of the seal rings 81 ~~and 82 seal the case 3 and supply oil to the oil lines 2a, and 2b provided within the input shaft 2, and therefore oil can be supplied to the oil compartment of the~~ ^{provide a between the bosses 3a and 3b of the case 3 and} ~~oil pressure~~ ^{hydraulic} servos 11 and 13 without providing seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ ^{hydraulic} servos 11 and 13. Further, the ~~oil pressure~~ ^{hydraulic} servo 12 can ~~supply oil~~ ^{be directly} ~~from the boss unit 3b provided from the case 3,~~ ^{with} ~~without~~ ^{i.e.} passing through other units for example. In other words, ~~can~~ ^{as can be established} ~~the~~ supply oil by providing one set of the seal rings 83.

Therefore, oil can be supplied simply by providing ~~one~~ ^{respective} sets of ~~the~~ seal rings 81 and 82, 83 ~~each~~ for the oil pressure servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.


Further, ~~the clutch C2 is a clutch that engages while at the first speed reverse, therefore when this clutch C2 is engaged at the first speed reverse,~~ ⁱⁿ ~~the transmitting member~~ ^{2nd}



30 rotates in ~~a~~ reverse ~~rotation~~, while there may be cases wherein by engaging ~~this~~ clutch C2, the hub unit 24 connecting this clutch C2 and the sun gear S2^{will} rotates at the ~~speed~~ ~~rotation~~ of the input shaft 2, and some cases may occur wherein the ~~revolution~~ ^{in rotational speeds} difference between the transmitting member 30 and the hub unit 24 may be large. However,

because this clutch C2 is located on the ~~opposite~~ side of ^{opposite} the planetary gear PR ~~via~~ the planetary gear unit PU, that is to say ² the transmitting member 30 and the hub unit 24 can be ~~configured~~ ^{spaced} apart, ~~compared with the case wherein~~ ^{a construction} ~~for example~~ those units are ~~configured~~ in contact with a multi-axial construction, the ~~decreased~~ ^{loss of} efficiency of the automatic transmission produced by friction resulting from the relative rotation between those units can be prevented.


Further, because the counter gear 5 is ^{located} ~~configured~~ ^{first} ~~the axial direction~~ between the planetary gear unit PU and the ^{second} ~~planetary gear~~ ^{unit} PR, the counter gear 5 can be ^{located} ~~configured~~ in approximately the ~~center in the axial direction~~ of the automatic transmission. ^{Thus} ~~for example~~, when the automatic transmission is mounted on the vehicle, enlarging ^{ment} ~~ing~~ towards ~~one direction of the axis (particularly in the rear direction)~~ (when the input side from the drive source is the front ~~direction~~) ^{is not required} can be prevented because the counter gear 5 is mounted to ^{mate with} ~~match~~ the drive wheel transmission mechanism. Because of this, particularly in the case of an FF vehicle,



the interference ^{with} ~~toward~~ the front wheels is reduced, ~~and~~ the mountability on a vehicle ^{is} ~~can be~~ improved, ^{and} ~~such~~ the steering angle ^{is} ~~being~~ greatly improved, ~~for example~~.

Further, the automatic transmission device 13 according ^{as} ~~to the present~~ ^{third} embodiment is ~~a transmission device that is~~ directly coupled ⁱⁿ ~~at~~ fifth speed forward. Therefore, ~~at~~ ⁱⁿ first speed forward and fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ ^{more precisely set for best efficiency}, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ^{speed} ~~can be utilized with~~ ^{reduced} better revolutions, and this contributes to increased fuel economy of the vehicle while running at a low to medium speed.

In order to ~~solve the above-described problems~~, ~~proposals have been made such as those in Japanese~~ Unexamined Patent Application Publication No. 8-68456, ^{discloses a transmission} However, ~~the product in this Publication has a construction~~ wherein a clutch is ^{located in power path of} ~~configured on the line that transmits~~ the reduced rotation ^{speed transfer from speed unit} ~~of the reducing planetary gear to the~~ rotary ^{first} ~~rotation component of the planetary gear unit, and because~~ ^{this power path} ~~the line that transmits this reduced rotation is a line~~ ^{speed with} ~~wherein a large torque is input, the clutch or members that~~ ^{high high} ~~transmit the torque must be constructed so as to withstand~~ ^{high} ~~this large torque. Further, the line for transmitting this~~ ^{member(s) constituting the power path} ~~reduced rotation is a part for rotating at a high speed, for~~ ^{speed}



example, when ⁱⁿ ~~at~~ sixth speed forward, and therefore, as in the above-mentioned Publication, in the event that the ~~transmission member (S)~~ ^{input rotary} construction links the drum of the clutch to the ~~rotation~~ component of the ^{first} planetary gear unit, controllability is lost when engaging and releasing this clutch because the drum unit changes shape because of the centrifugal force ^{generated} ~~due~~ ^{at} ~~the high speed~~ ^{speed} ~~revolutions~~. Therefore, it is an object of the present invention to provide an automatic transmission wherein the controllability of the clutch ~~is not lost~~ ^{utilized} as a reduced rotation output means, ^{is not lost} even at ~~a~~ high speed ~~rotation~~ ^{rotation} of the ~~rotation~~ ^{rotary} component of the ^{first} planetary gear unit.

^{In} Further, ~~according to the automatic transmission device~~ ^{as} ~~third~~ ^{third} 13, according to the present embodiment, the clutch C1 ^{connects/disconnects} links the input shaft 2 and the sun gear S1 ~~so as to be capable of~~ ^{and,} ~~disengaging,~~ therefore, compared with ^{with a transmission} for example, the case wherein the clutch C1 ^{connects/disconnects} ~~makes~~ the ring gear R1 and the sun gear S3 ~~capable of disengaging,~~ the load on the clutch C1 ^{is less,} ~~can be reduced, and can prevent the loss of controllability~~ ^{is prevented} of the clutch C1, and further, the clutch C1 can be made more compact.

Further, the ~~drum-shaped member~~ ^{first} 21 of the clutch C1 is linked to the input shaft 2, and the hub unit 22 is linked to the sun gear S1 of the ^{unit and} planetary gear ^{clutch} PR, therefore, the hub unit 22 which has a smaller diameter than the ~~drum~~

shaped member 21 can be linked, for example, with the sun gear S1 that rotates at a high ^{speed} ~~revolution~~ when ⁱⁿ ~~at~~ sixth speed forward. ^{Thus,} and compared to the case wherein the sun gear S1 is linked to the drum ^{clutch} ~~shaped member~~, ^{in this third embodiment} the centrifugal force can be reduced, and ^{reduction of} ~~the decrease of~~ controllability of the clutch C1 when engaging and releasing can be prevented.

~~Fourth Embodiment~~

The fourth embodiment, which is a partial modification of the third embodiment will be described with reference to Fig. 8. ~~Fig. 8 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the fourth embodiment.~~ Components of the fourth embodiment which are the same as those of the third embodiment ^{are} ~~will be~~ denoted ^{by} ~~with~~ the same reference numerals, and description thereof omitted, except for ^{the} ~~partial~~ ^{ed components} ~~modifications~~.

As Fig. 8 illustrates, the automatic transmission ~~device 14 of the automatic transmission relating to the~~ fourth embodiment has a modified ~~configuration of the~~ ^{unit} ~~second~~ planetary gear PR and ~~the~~ ^{i.e. modification} clutch C1, compared to that of the automatic transmission ~~device 13 of the automatic~~ ~~transmission~~ of the third embodiment (see Fig. 5).

With the automatic transmission ~~device 14~~, the clutch C1 is disposed ^{axially} ~~between~~ ^{second} ~~the~~ planetary gear ^{unit} PR and the ^{first} ~~planetary~~ gear unit PU ~~in the axial direction~~, specifically between

the ^{second} planetary gear ^{unit} PR and the counter gear 5. The drum ~~shaped member~~ 21 is connected to one end of the input shaft 2 (at the upper right side in the drawing), and the friction plate 71 of the clutch C1 which ~~is capable of engaging by~~ ^{are} ~~engaging by~~ ^{ed under control} of the clutch C1 ~~oil pressure servo 11 is disposed by splining~~ ^{hydraulic} ~~to~~ ^{are} ~~at the inner circumference side of the front end of the~~ ^{are} ~~drum shaped member 21~~ ^{are} ~~On the inner circumference side of~~ ^{are} ~~the friction plate 71 of this clutch C1 is configured a hub~~ ^{are} ~~unit 22 by being splined,~~ ^{are} ~~and this hub unit 22 is connected~~ ^{are} ~~to the sun gear S1 of the planetary gear PR.~~ ^{are}

The carrier CR1 of the ^{second} planetary gear ^{unit} PR ~~has the pinion~~ ^{carries} ~~Pa and the pinion Pb,~~ ^{which} ~~the pinion Pb meshes with the above-~~ ^{which} ~~mentioned ring gear R1, and the pinion Pa meshes with the~~ ^{which} ~~sun gear S1 which is connected to the hub unit 22. The~~ ^{which} ~~carrier CR1 is fixed to the case 3 through the side plate,~~ ^{which} ~~and the ring gear R1 is connected with the transmitting~~ ^{which} ~~member 30. The sun gear S3 of the planetary gear unit PU is~~ ^{which} ~~connected to the other side of the transmitting member 30.~~ ^{which}

Also, the oil chamber "a" of the ^{hydraulic} ~~oil pressure~~ servo 11 of the clutch C1 communicates with the oil path 2a of the input shaft 2, and the oil path 2a communicates with an ~~unshown~~ oil pressure control device through the oil path 91 of the boss 3a. In other words, because the ~~above mentioned~~ ^{hydraulic} ~~oil pressure~~ servo 11 is ~~configured~~ ^{mounted} on the input shaft 2, an oil line from the oil pressure control unit ~~not illustrated~~

to the oil chamber "a" of the oil pressure servo 11 is constructed by one set of seal rings 81 ^{which provides a} to seal between this boss ~~unit~~ 3a and the input shaft 2.

The operations of the automatic transmission ~~device~~ 14 ^{of this fourth embodiment} according to the above configuration are the same as those of the third embodiment (see Fig. 6 and Fig. 7), and according ^{to} description thereof will be omitted.

As described above, ⁱⁿ according to the automatic transmission ~~device~~ 14 ^{of the fourth embodiment} relating to the present invention, the ^{second} planetary gear ^{unit} PR and the clutch C1 are ^{located} configured on one ^{axial} side in the axial direction of the ^{first} planetary gear unit PU, and the clutch C2 and the clutch C3 are ^{located} configured on the other ^{axial} side ~~in the axial direction~~ of the ^{first} planetary gear unit PU. ^{The} Therefore, ^{of the fourth embodiment} an automatic transmission ~~can be~~ provided ³ that ~~will achieve~~ six forward speeds and one reverse speed, with direct coupling ⁱⁿ ~~at~~ the fifth speed ^{a transmission} forward. For example, compared to the case wherein the ~~clutch C2 or clutch C3 is configured between the planetary gear PR and the planetary gear unit PU, the planetary gear PR, and the planetary gear unit PU can be configured closer together, and the transmitting member 30 for transmitting the reduced rotation can be made relatively short.~~ ^{located} ^{unit} ^{first} ^{in this fourth embodiment} ^{second} ^{located} ^{which} ^{speed} ^{or} ^{more} ^{inertial} ^(force of)

Therefore, the automatic transmission can be made compact and lightweight, and further, because the inertia ^(force of) ~~inertia~~ can be reduced, the controllability of the

automatic transmission can be improved, and the occurrence of speed change shock can be reduced.

Further, the clutch C1 is ^{located} ~~configured~~ on one side ^{axial} ~~in the~~ ~~axial direction~~ of the planetary gear unit PU, and the clutch C2 and the clutch C3 are ^{located} ~~configured~~ on the other ^{axial} ~~side~~ ~~in the axial direction~~ of the planetary gear unit PU.

^{a transmission} Therefore compared to the ~~case~~ wherein, for example, the three clutches C1, C2, and C3 are ^{located} ~~configured~~ on one ^{axial} ~~side~~ of the planetary gear unit PU, the construction of an oil line (for example, 2a, 2b, 91, 93, 94) to provide oil to the ~~oil~~ ^{hydraulic} pressure servos 11, 12, and 13 ^{which operate, respectively,} ~~for these~~ clutches C1, C2, and C3 can be made easily, ~~and~~ ^{reduced} the manufacturing process can be simplified and the costs ^{hydraulic} brought down.

^{between} Further, because the ~~oil pressure~~ ^{hydraulic} servos 11 and 13 are ~~provided~~ on the input shaft 2, one set of the seal rings 81 and 82 ^{provide a} ~~seal the case 3 and supply oil to the~~ oil lines 2a, and 2b provided within the input shaft 2, and therefore oil can be supplied to the oil compartment ⁵ of the ~~oil pressure~~ ^{hydraulic} servos 11 and 13 without providing seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ ^{hydraulic} servos 11 and 13. Further, the ~~oil pressure~~ ^{hydraulic} servo 12 can ^{receive of} supply oil ^{directly} from the boss ~~unit 3b provided from the case 3~~ without passing through other units, ^{an} ~~for example~~. In other words, ^{paths are established} ~~supply oil~~ by providing one set of ~~the seal rings 83~~. Therefore, ~~oil can be supplied simply by providing one set~~

of ~~the~~ seal rings 81 and 82, 83 each for the ~~oil pressure~~ ^{hydraulic} servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, ^{when} ~~since~~ the clutch C2 is a ~~clutch that~~ ^{clutch} engaged ⁱⁿ while at first speed reverse, ~~when this clutch is engaged~~ ^{at first speed reverse}, the transmitting member 30 rotates in ~~a~~ reverse ~~rotation~~, and while the hub unit 24 that connects this clutch C2 and the sun gear S2 has the same rotation as the input shaft 2 ~~by engaging this clutch C2~~, ^{and there may be a large} ~~cases wherein the~~ ^{rotation difference of the} transmitting member 30 and the hub unit 24, ~~becomes large~~, ^{However,} ~~but~~ because this clutch C2 is located on the opposite side ^{of the planetary gear PR, via the planetary gear unit PU,} the transmitting member 30 and the hub unit 24 can be ^{spaced} ~~configured~~ apart from one another. Compared to the case wherein, for example, those parts come in contact due to a multi-axial construction, the decreased ⁱⁿ efficiency of the automatic transmission caused by the friction produced by the relative rotation between those parts can be prevented.

Further, because the counter gear 5 is ^{located} ~~configured~~ in ~~the axial direction~~ ^{first} between the planetary gear unit PU and the planetary gear ^{second unit} PR, the counter gear 5 can be ^{located} ~~configured~~ in approximately the ^{axial} ~~center in the axial direction~~ of the automatic transmission. For example, when the automatic

transmission is mounted on the vehicle, enlarging^{ment} towards
~~one direction of the axis (particularly in the rear~~
~~direction~~ (when the input side from the drive source is the
front ~~direction~~) ^{is unnecessary} can be prevented because the counter gear 5
is mounted to ~~match~~ ^{mate with} the drive wheel transmission mechanism.
Because of this, particularly in the case of an FF vehicle,
~~the~~ interference ^{with} ~~toward~~ the front wheels is reduced, ~~and the~~
mountability on a vehicle ~~can be~~ ^{is} improved, ~~such~~ ^{and} the steering
angle ~~being~~ ^{is} greatly improved, ~~for example.~~

Further, the automatic transmission ~~device 14 according~~
~~to the present embodiment is a transmission device that is~~
^{in fourth} directly coupled at fifth speed forward. Therefore, ~~at~~ ²¹³⁰ in
first speed forward or fourth speed forward, the gear ratio
can be ~~specified in a detailed manner,~~ ^{more precisely set for maximum efficiency} and particularly when
~~mounted on a vehicle, in the event that the vehicle is~~
running at a high speed, the engine can be ~~utilized with~~ ^{speed reduced}
~~better revolutions,~~ and this contributes to increased fuel
economy of the vehicle while running at a low to medium
speed.

In order ~~to~~ solve the above-described problems,
proposals have been made such as those in Japanese
Unexamined Patent Application Publication No. 8-68456.
However, the product in this Publication has a construction
wherein a clutch is configured on the line that transmits
the reduced rotation of the reducing planetary gear to the

rotation component of the planetary gear unit, and because the line that transmits this reduced rotation is a line wherein a large torque is input, the clutch or members that transmit the torque must be constructed so as to withstand this large torque. Further, the line for transmitting this reduced rotation is a part for rotating at a high speed for example when at sixth speed forward, and therefore, as in the above-mentioned Publication, if the construction links the drum of the clutch to the rotation component of the planetary gear unit, controllability is lost when engaging and releasing this clutch because the drum unit changes shape because of the centrifugal force due to the high revolutions. Therefore, it is an object of the present invention to provide an automatic transmission wherein the controllability of the clutch is not lost as a reduced rotation output means, even at a high speed revolution of the rotation component of the planetary gear unit.

~~Further, according to the automatic transmission device~~
14 according to the ^{fourth} ~~present~~ embodiment, the clutch C1 ~~links~~ ^{selectively connects or disconnects} the input shaft 2 and the sun gear S1, ~~so as to be capable of disengaging.~~ Therefore, compared with, for example, ^{a transmission} ~~the case~~ wherein the clutch C1 ^{connects} ~~makes~~ the ring gear R1 and the sun gear S3 ~~capable of disengaging~~, the load on the clutch C1 can be reduced, ^{reduction in} ~~and can prevent the loss of controllability~~ ^{is prevented} of the clutch C1, and further, the clutch C1 can be made

more compact.

Further, the drum ~~shaped member~~ 21 of the clutch C1 is linked to the input shaft 2, and the hub unit 22 is linked to the sun gear S1 of the ^{second} planetary gear ^{unit and} PR, therefore, the hub unit 22 which has a smaller diameter than the drum ~~shaped member~~ 21 can be linked for example with the sun gear S1 that rotates at a high ^{speed} revolution when ⁱⁿ sixth speed forward, and compared to the case wherein the sun gear S1 is linked to the drum ~~shaped member~~, the centrifugal force can be reduced, and ^{reduction} the decrease of controllability of the clutch C1 ~~when engaging and releasing~~ can be prevented.

~~W~~ Fifth Embodiment ~~A~~

The fifth embodiment, which is a partial modification of the third embodiment ^{now} will be described ~~with~~ with reference to Fig. 9. ~~Fig. 9 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the fifth embodiment.~~
~~Now,~~ Components of the ^{fifth} ~~fourth~~ embodiment which are the same as those of the third embodiment ^{are} will be denoted ^{by} with the same reference numerals, and description thereof omitted, except for ^{the} ~~partial~~ ^{ed} modifications. ^{components.}

As Fig. 9 illustrates, the automatic transmission ~~device 15 of the automatic transmission relating to the~~ fifth embodiment has ~~a configuration wherein the~~ clutch C1 ^{mounted} ~~is configured~~ on the boss ~~unit~~ 3a, rather than on the input

and in this respect ⁵⁶ differs from

shaft 2, ~~compared to the automatic transmission device 13 of the automatic transmission of the third embodiment~~ (see Fig. 5).

In With the automatic transmission device ^{of the 5th embodiment} 15, the clutch C1 is disposed on the ~~opposite~~ ^{opposite} side of the planetary gear unit PU ~~as to the planetary gear PR~~ ^{second unit} (to the right in the drawing).

The drum-shaped member 21 is disposed rotatably supported on the boss ~~unit~~ 3a extended ^{from} the case 3, and the inner circumference ^{of its} side of the front end of the drum-shaped

member 21 of the clutch C1 is connected to the input shaft 2. ~~Also, the friction plate 71 is disposed by splining at the inner circumference side of the front end of the drum-shaped member 21, and on the inner circumference side of the friction plate 71 of this clutch C1 is splined the hub unit 22 connected to the sun gear S1 of the planetary gear PR.~~ ^{are ed to} ^{axial surface, at} ^{are intermeshed with} ^{to} ^{second unit}

The carrier CR1 of the ^{second} planetary gear ^{unit} PR has ~~the pinion Pa and the pinion Pb, the pinion Pb meshes with the above mentioned ring gear R1, and the pinion Pa meshes with the sun gear S1 which is connected to the hub unit 22.~~ ^{which} ^{which} ^a ^{to one end of} ^{first} ^{end} The carrier CR1 is fixed to the case 3 through the side plate, and the ring gear R1 is connected with the transmitting member 30. The sun gear S3 of the planetary gear unit PU is connected to the other ~~side~~ ^{end} of the transmitting member 30.

~~Also~~ The oil chamber "a" of the ^{hydraulic} oil pressure servo 11 of the clutch C1 communicates with the oil path 91 ⁱⁿ of the

boss ~~unit~~ 3a, and the oil path 91 communicates with an unshown oil pressure control device. In other words, because the ~~above-mentioned~~ ^{hydraulic} oil pressure servo 11 is ^{mounted} ~~configured~~ on the boss ~~unit~~ 3a, an oil ^{supply path} ~~line~~ from the oil pressure control unit ~~not illustrated~~ to the oil chamber "a" of the ~~oil pressure~~ ^{hydraulic} servo 11 is constructed ~~by~~ ^{with} one set of seal rings 81 ^{which provides a} ~~to~~ seal between the boss ~~unit~~ 3a and the ~~oil~~ ^{hydraulic} pressure servo 11.

The operations of the automatic transmission ~~device~~ 15 ^{of the fifth embodiment} according to the ~~above configuration~~ are the same as those of the third embodiment (see Fig. 6 and Fig. 7), and accordingly, ⁱⁿ description thereof will be omitted.


As described above, ~~according to~~ ⁱⁿ the automatic transmission ~~device~~ 15 ^{of the fifth embodiment} relating to the present invention, the ^{second} planetary gear ^{unit} PR and the clutch C1 are ^{located} ~~configured~~ on one ^{axial} side ~~in the axial direction~~ of the ^{first} planetary gear unit PU, and the clutch C2 and the clutch C3 are ^{located} ~~configured~~ on the other ^{axial} side ~~in the axial direction~~ of the ^{first} planetary gear unit PU. ~~Therefore, an automatic transmission can be~~ ^{as the fifth embodiment} provided ^{that} ~~will achieve~~ six forward speeds and one reverse speed, with direct coupling ⁱⁿ ~~at the~~ fifth speed forward. ^{In this fifth embodiment also,} For example, compared to the case wherein the clutch C2 or clutch C3 is ^{located} ~~configured~~ between the ^{second} planetary gear ^{unit} PR and the ^{first} planetary gear unit PU, the ^{second} planetary gear ^{unit} PR and the ^{first} planetary gear unit PU can be ^{located} ~~configured~~ closer

together, and the transmitting member 30 for transmitting the reduced ^{speed} rotation can be made relatively shorter.

Therefore, the automatic transmission can be made ^{more} compact and lightweight, and further, because the inertia ^{inertial} (force) ~~of inertia~~ can be reduced, the controllability of the automatic transmission can be improved, and the occurrence of speed change shock can be reduced.


^{Because} ~~Further~~, the clutch C1 is ^{located} ~~configured~~ on one ^{axial} side ~~in the~~ ^{first} ~~axial direction~~ of the planetary gear unit PU, and the clutch C2 and the clutch C3 are ^{located} ~~configured~~ on the other ^{axial} side ~~in the axial direction~~ of the planetary gear unit PU, ^{with} ~~therefore~~ compared to the case wherein, ^{for example}, the three clutches C1, C2, and C3 are ^{located} ~~configured~~ on one ^{axial} side of the planetary gear unit PU, the construction of an oil line ^{first} (for example, 2a, 2b, 91, 93, 94) ^{for} ~~to~~ provide ^{ing} oil to the ~~oil~~ ^{hydraulic} pressure servos 11, 12, and 13 ^{more} ~~for these clutches C1, C2, and C3~~ can be made easily, ~~and~~ the manufacturing process can be simplified and the costs brought down.

Further, because the ^{hydraulic} ~~oil pressure~~ servos 11 and 13 are ^{mounted} ~~provided~~ on the input shaft 2, ^{sets of} ~~one set of~~ the seal rings 81 and 82 seal the ^{bosses 3a and 3b respectively} ~~case 3~~ and supply oil to the oil lines 2a, and 2b provided within the input shaft 2, and therefore oil can be supplied to the ^{respective} ~~oil~~ compartment ³ of the ^{hydraulic} ~~oil pressure~~ servos 11 and 13 without providing seal rings between, for example, the input shaft 2 and the ^{hydraulic} ~~oil pressure~~ servos 11



and 13. Further, the ~~oil pressure~~ ^{hydraulic} servo 12 can ^{be} ~~supply~~ ^{ied} oil from the boss unit 3b ^{extending} ~~provided~~ from the case 3, without ~~that supply~~ passing through other units ~~for example~~ ^{or}, in other words, can ~~be established~~ ^{be established} by providing one set of the seal rings 83. Therefore, ^{an path} ~~oil~~ ^{established} can be ~~supplied~~ simply by providing one set of ~~the~~ seal rings 81 and 82, 83 ^{of} each for the ~~oil pressure~~ ^{hydraulic} servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, ^{when} ~~since~~ the clutch C2 is ~~a clutch that~~ engaged ⁱⁿ while at first speed reverse, ~~when this clutch 2 is engaged~~ at first speed reverse, the transmitting member 30 rotates ^{with} in a reverse rotation, and while the hub unit 24 that connects this clutch C2 and the sun gear S2 has the same rotation as the input shaft 2 ^{due to engagement of} by engaging this clutch C2, ~~there may be cases wherein the rotation difference of the~~ ^{the} ~~transmitting member 30 and the hub unit 24 becomes large,~~ ^{between rotational speeds} ~~may be~~ ^{However} ~~but~~ because this clutch C2 is located on the ~~opposite side~~ ^{opposite second unit} of the planetary gear PR, ^{of} ~~via~~ the planetary gear unit PU, the transmitting member 30 and the hub unit 24 can be ^{spaced} ~~configured~~ apart from one another. Compared to the case wherein, for example, those parts come in contact due to a multi-axial construction, the decreased efficiency of the automatic transmission caused by the friction produced by the relative rotation between those parts can be prevented.



Further, because the counter gear 5 is ^{located} ~~configured~~ in ^{first} ~~the~~ axial ^{second} ~~direction~~ between the planetary gear unit PU and the planetary gear PR, the counter gear 5 can be ^{unit} ~~configured~~ ^{positioned} in approximately the ~~center in the axial direction~~ of the automatic transmission. For example, when the automatic transmission is ^{In this manner} ~~mounted on the vehicle~~, enlarging towards ^{ment of the transmission} ~~one direction of the axis~~ (particularly in the rear ~~direction~~ (when the input side ^{is} ~~from the drive source is the front direction~~) ^{is not necessarily} ~~can be prevented~~ because the counter gear 5 is mounted to ^{mate with} ~~match~~ the drive wheel transmission mechanism. Because of this, particularly in the case of an FF vehicle, the interference ^{with} ~~toward~~ the front wheels is reduced, ~~and~~ the mountability on a vehicle ^{is} ~~can be~~ improved, ^{and} ~~such~~ the steering angle ^{is} ~~being~~ greatly improved, for example.

Further, ^{because} ~~the~~ automatic transmission ¹⁵ ~~device 14~~ according to the present embodiment is ^{fifth} ~~a transmission device that is~~ directly coupled ⁱⁿ ~~at~~ fifth speed forward ¹¹ ~~Therefore, at~~ first speed forward or fourth speed forward, the gear ratio can be ^{more precisely set for efficiency} ~~specified in a detailed manner~~, and particularly when ~~mounted on a vehicle, in the event that the vehicle is~~ running at a high speed, the engine can be ^{operated more} ~~utilized with~~ ^{efficiently} ~~better revolutions~~, and this contributes to increased fuel economy of the vehicle while running at a low to medium speed.

~~In order to solve the above described problems,~~

proposals have been made such as those in Japanese Unexamined Patent Application Publication No. 8-68456. However, the product in this Publication has a construction wherein a clutch is configured on the line that transmits the reduced rotation of the reducing planetary gear to the rotation component of the planetary gear unit, and because the line that transmits this reduced rotation is a line wherein a large torque is input, the clutch or members that transmit the torque must be constructed so as to withstand this large torque. Further, the line for transmitting this reduced rotation is a part for rotating at a high speed for example when at sixth speed forward, and therefore, as in the above-mentioned Publication, if the construction links the drum of the clutch to the rotation component of the planetary gear unit, controllability is lost when engaging and releasing this clutch because the drum unit changes shape because of the centrifugal force due to the high revolutions. Therefore, it is an object of the present invention to provide an automatic transmission wherein the controllability of the clutch is not lost as a reduced rotation output means, even at a high speed revolution of the rotation component of the planetary gear unit.

Further, ⁱⁿ ~~according to the automatic transmission device~~
15 ~~according to the present embodiment~~, the clutch C1 ^{51st} ~~links~~ ^{engages/disengages}
the input shaft 2 and the sun gear S1 ~~so as to be capable of~~

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~~and~~ disengaging, therefore, compared with, for example, the case wherein the clutch C1 ~~makes~~ ^{engages/disengages} the ring gear R1 and the sun gear S3 ~~capable of disengaging~~, the load on the clutch C1 ^{is} can be reduced, and ~~can prevent the loss of~~ ^{is retained} controllability of the clutch C1, and further, the clutch C1 can be made more compact.

Further, the clutch C1 is ^{mounted} ~~configured~~ on the boss unit 3a where ⁱⁿ the oil path 91 from the oil pressure control device is formed, and accordingly, the automatic transmission 15 can be made more compact ^{axially} ~~in the axial direction~~ as compared with the case wherein the clutch C1 is ^{mounted} ~~configured~~ on the input shaft 2, for example (see Fig. 5).

Further, the drum-shaped member 21 of the clutch C1 is linked to the input shaft 2, and the hub unit 22 is linked to the sun gear S1 of the ^{second} planetary gear ^{unit and} PR, therefore, the hub unit 22 which has a smaller diameter than the drum ~~shaped member~~ 21 can be linked, for example, with the sun gear S1 that rotates at a high ^{speed in} ~~revolution when at~~ sixth speed forward, and compared to the case wherein the sun gear S1 is linked to the drum-shaped member, the centrifugal force can be reduced, and ~~the decrease of~~ controllability of the clutch C1 when engaging and releasing can be ^{retained} ~~prevented~~.

Sixth Embodiment

Next, the sixth embodiment, which is a partial modification of the first embodiment, will be described.

with reference to Fig. 10 through Fig. 12. Fig. 10 is a schematic cross sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the sixth embodiment, Fig. 11 is a operational table of an automatic transmission relating to the sixth embodiment, and Fig. 12 is a speed line diagram of an automatic transmission relating to the sixth embodiment. Now, Components of the sixth embodiment which are the same as those of the first embodiment ~~will be~~ ^{are} denoted ~~with~~ ^{by} the same reference numerals, and description thereof omitted, except ~~for partial~~ ^{where} modifications ^{ed}.

As Fig. 10 illustrates, the automatic transmission device 1₆ of the ~~automatic transmission relating to the~~ ^{sixth} ~~fourth~~ embodiment ~~configures~~ ^{includes} a brake B3 (the "reduced rotation output means", the "third engaging component", the "third brake") in place of the clutch C1, and ~~changed~~ the carrier CR1 of the planetary gear PR ^{is} so as to be capable of being fixed by the brake B3, ~~compared to that of the~~ ^{in which respects it differs from} automatic transmission device 1₁ of the automatic transmission of the first embodiment (see Fig. 1).

The brake B3 is ^{located} ~~configured~~ on the ~~opposite~~ side of the ~~opposite the first~~ planetary gear unit PU (right side of diagram) of the ~~second~~ ^{unit} planetary gear PR within this automatic transmission device 1₆. This brake B3 comprises ~~an oil pressure servo 16,~~ ^{a hydraulic} friction plate ⁵76, and a hub unit 33.

The hub unit 33 of ~~this~~ brake B3 is connected to one side plate of the carrier CR1, and ~~this~~ carrier CR1 is *rotatably* supported by the input shaft 2 or the boss ~~unit~~ 3a, ~~so as to be capable of rotating.~~ Further, the sun gear S1 is connected to the input shaft 2. Also, ~~this~~ ring gear R1 is connected to the ~~transmitting member 30,~~ and the sun gear S3 ~~is connected via this transmitting member 30.~~

~~Continuing, based on the above-mentioned construction,~~
~~the~~ Operations of the automatic transmission device 1₆ will *now* be described, *with reference to* ~~following Fig. 10, Fig. 11, and Fig. 12 below.~~
As described in connection with the
~~Now, similar to the above-described first embodiment, the~~
vertical ~~axis~~ *lines in* of the speed line diagram ~~illustrated in Fig. 12 indicate the revolutions of each rotation component,~~ *of* and the horizontal axis ~~indicates~~ *speeds* the corresponding gear ratios *various rotary* of these ~~rotation components.~~ *shows* Further, *these* regarding the planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the right side of Fig. 12)~~ *in* corresponds to the sun gear S3₅ and, ~~hereafter moving to the left-direction within the diagram,~~ the vertical ~~axis~~ *lines* corresponds to the ring gear R3, the carrier CR2, and the sun gear S2. Further, *in* regarding the planetary gear PR section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the right side of Fig. 12)~~ *in* corresponds to the sun gear S1₂ and, ~~hereafter moving to the left-direction within the diagram,~~

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the vertical ~~axis~~ ^{lines} corresponds to the ring gear R1 and the carrier CR1. Further, the ~~width~~ ^{distances} between these vertical ~~axes~~ ^{lines} are ^{inversely} proportional to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to ~~the inverse of the~~ number of teeth of each of the ring gears R1, R3. Also, the dotted ~~line in a horizontal direction~~ ^(line in a horizontal) within the diagram ~~represents~~ ^{illustrate} that the rotation ~~is~~ ^{by} transmitted from the transmitting member 30.

As illustrated in Fig. 10, the ~~above mentioned~~ carrier CR1 is fixed to the case 3 by ^{engagement of} the brake B3 ~~retaining~~.

Further, the rotation of the input shaft 2 is input to the sun gear S1, ^{and} the ~~above mentioned~~ ring gear R1 ^{rotates a lower speed} ~~decreases~~ ^{than speed of} rotation speed based on the rotation of the input shaft 2 that is input to ~~this~~ sun gear S1, ^{the} ~~by this~~ carrier CR1 being fixed. In other words, the reduced ^{with} rotation of the ring gear R1 is input to the sun gear S3 via the transmitting member 30, by engaging the brake B3.

~~By doing so,~~ ^{As} Fig. 11 and Fig. 12 illustrate, regarding the planetary gear PR, ^{at} first speed forward, second speed forward, third speed forward, and fourth speed forward, the rotation of the input shaft 2 is input to the sun gear S1 by ^{engaging} ~~retaining~~ the brake B3, the carrier CR1 is fixed, and the reduced ^{speed} rotation is output to the ring gear R3 by the rotation of the sun gear S1 ^{which receives} ~~wherein the rotation~~ of the input shaft 2 ~~is input~~, and the reduced ^{speed} rotation is

input to the sun gear S3 via the transmitting member 30. In this case, the ring gear R1 and the sun gear S3 are rotating at reduced speed, ^{and} therefore the ~~above-mentioned~~ transmitting member 30 ^{transmits} ~~performs~~ a relatively large torque ~~transmission~~. On the other hand, ⁱⁿ at fifth speed forward, sixth speed forward, and first speed reverse, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 30, and further, because the brake B3 is released, as Fig. 12 illustrates, the carrier CR1 rotates based on ~~each~~ ~~rotation within the speed level of this~~ ring gear R1 and the sun gear S1 ~~of the rotation of the input shaft 2~~. ^{operations of the second planetary gear unit of the sixth embodiment} ~~Now, the actions other than those of the above~~ mentioned planetary gear PR are similar to those of the above-described first embodiment, and accordingly, description thereof will be omitted.

As described above, ⁱⁿ ~~according to~~ the automatic transmission device 16 ^{of the sixth embodiment} ~~relating to the present invention,~~ the ^{second} planetary gear ^{unit} PR and the brake B3 are ^{located} ~~configured~~ on one ^{first} axial side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C2 and the clutch C3 are ^{located} ~~configured~~ on the other ^{first} ~~side in the axial~~ direction of the planetary gear unit PU. Therefore, ^{the} ~~an~~ automatic transmission ~~can be provided~~ ~~that~~ will achieve six forward speeds and one reverse speed, with direct coupling ⁱⁿ at fifth speed forward. ^{compared} ~~For example,~~ ^{with} ~~compared to~~ the case wherein the clutch C2 or clutch C3 is

~~located~~ ^{second} ^{unit} ^{first}
~~configured~~ between the planetary gear ^{second} ^{unit} ^{first} PR and the planetary gear unit PU, the planetary gear ^{located} PR and the planetary gear unit PU can be ~~configured~~ close together, and the transmitting member 30 ~~for transmitting the reduced rotation~~ can be made relatively short. ^{or} Therefore, the automatic transmission can be made ^{more} compact and lightweight, and further, because the inertia ~~(force of inertia)~~ can be reduced, the controllability of the automatic transmission can be improved, and the occurrence of speed change shock can be reduced.

Further, because the oil pressure servo 13 is ^{mounted} ~~provided~~ on the input shaft 2, one set of the seal rings 82 ^{form a} ~~seal~~ the ^{between} ~~case 3b~~ and ~~supply oil to the~~ oil lines 2b provided within the input shaft 2, and therefore oil can be supplied to the oil compartment of the ^{hydraulic} ~~oil pressure~~ servo 13 without providing seal rings between, for example, the input shaft 2 and the ^{hydraulic} ~~oil pressure~~ servo 13. Further, the ^{hydraulic} ~~oil pressure~~ servo 12 can ^{receive directly} ~~supply~~ oil from the boss ~~unit~~ 3b ~~provided from the case 3~~, without passing through other units, ~~for example~~. In other words, ^{or is secured} ~~can~~ supply oil by providing one set of the seal rings 83. Therefore, oil can be supplied simply by providing one set of the seal rings 82 and 83 ^{each of} ~~each~~ for the ^{hydraulic} ~~oil pressure~~ servos 12 and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, ^{when} ~~since~~ the clutch C2 ~~is a clutch that~~ engages ⁱⁿ ~~while at~~ first speed reverse, ~~when this clutch 2 is engaged~~ ~~at first speed reverse~~, the transmitting member 30 rotates in ~~a~~ reverse ~~rotation~~, and ~~while~~ the hub unit 24, that connects this clutch C2 and the sun gear S2, has the same rotation as the input shaft 2 ^{at speed} ~~by engaging this clutch C2~~ ~~there may be cases wherein the rotation difference of the~~ ^{and the in rotational speed between} transmitting member 30 and the hub unit 24 ^{may be} ~~becomes~~ large. ^{However,} ~~but~~ because this clutch C2 is located on the opposite side ^{of the first} ~~of the~~ planetary gear ^{unit} PR, ^{opposite second unit} ~~via the~~ planetary gear unit PU, the transmitting member 30 and the hub unit 24 can be ^{spaced} ~~configured~~ apart from one another. Compared to the case wherein, for example, those parts come in contact ⁱⁿ ~~due to~~ a multi-axial construction, ^{loss in} ~~the decreased~~ efficiency of the automatic transmission caused by the friction produced by the relative rotation between those parts can be prevented.

Further, because the counter gear 5 is ^{located} ~~configured in~~ ^{first} ~~the~~ axial ^{direction} between the planetary gear unit PU and the ^{second unit} ~~planetary gear~~ PR, the counter gear 5 can be ^{located} ~~configured~~ in approximately the center ^{axial} ~~in the axial direction~~ of the automatic transmission. ^{As in the previous embodiments,} ~~For example,~~ when the automatic transmission is mounted on the vehicle, enlarging ^{event} ~~towards~~ ~~one direction of the axis (particularly in the rear~~ ^{facing} ~~direction~~ (when the input side from the drive source is the ^{front} ~~front~~ ^{is not necessary} ~~direction~~) can be prevented because the counter gear 5

is mounted to ~~match~~ ^{mate with} the drive wheel transmission mechanism.

Because of this, particularly in the case of an FF vehicle, ~~the~~ ^{with} interference ~~toward~~ the front wheels is reduced, ~~and the~~ mountability on a vehicle ~~can be~~ ^{is} improved, ~~such~~ ^{incl} the steering angle ~~being~~ ^{can be} greatly improved, for example.

Further, because the reduced rotation ~~output~~ ^{output of} to the ~~first~~ ^{second} planetary gear unit PU from the planetary gear PR is ~~made to~~ ^{UNIT} ~~engage and disengage~~ ^{ment of} by the brake B3, the number of ~~parts~~ ^{components} (for example ~~drum-shaped members~~ ^{clutch drums} and so forth) can be reduced ^{as} compared to the case wherein, for example, a clutch C1 is provided. Further, ^{because} the brake B3 can ~~configure an~~ ^{receive} oil ~~line~~ directly from the case 3, ~~and therefore the~~ ^{as} construction of an oil line can be simplified ^{as} compared to the case wherein, for example, a clutch C1 is provided.

Further, ^{because} the automatic transmission ~~device~~ ^{of} 1, ~~according~~ ^{sixth} to the present embodiment is ~~a transmission device that is~~ directly coupled at fifth speed forward, ⁱⁿ ~~Therefore, at~~ first speed forward or fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ ^{better set for efficiency}, and particularly when ~~mounted on a vehicle, in the event that the vehicle is~~ running at a high speed, the engine can be ~~utilized~~ ^{run} with better ~~revolutions~~ ^{efficiency}, and this contributes to increased fuel economy of the vehicle while running at a low to medium speed.

~~In order to solve the above-described problems,~~



proposals have been made such as those in Japanese

Unexamined Patent Application Publication No. 8-68456.

However, the product in this Publication has a construction wherein a clutch is configured on the line that transmits the reduced rotation of the reducing planetary gear to the rotation component of the planetary gear unit, and because the line that transmits this reduced rotation is a line wherein a large torque is input, the clutch or members that transmit the torque must be constructed so as to withstand this large torque. Further, the line for transmitting this reduced rotation is a part for rotating at a high speed for example when at sixth speed forward, and therefore, as in the above-mentioned Publication, if the construction links the drum of the clutch to the rotation component of the planetary gear unit, controllability is lost when engaging and releasing this clutch because the drum unit changes shape because of the centrifugal force due to the high revolutions. Therefore, it is an object of the present invention to provide an automatic transmission wherein the controllability of the clutch is not lost as a reduced rotation output means, even at a high speed revolution of the rotation component of the planetary gear unit.

~~Therefore, according to~~ ^{In} the automatic transmission device 1, ^{of} ~~relating to the present~~ ^{sixth} embodiment, the carrier CR1 is fixed by the brake B3, and therefore, compared to the

case wherein ^a ~~the~~ clutch ^{is used to connect/disconnect} ~~that makes~~ ring gear R1 and the sun gear S3 ~~capable of disengaging~~, the load on the brake B3 can be reduced, this brake B3 can be made more compact, and the automatic transmission can also be made more compact.

^{While} ~~Now~~, the ~~above~~ first through sixth embodiments relating to the present invention have been described ^{above} as being applicable to an automatic transmission having a torque converter, ^{they are so} ~~but should not be limited to this~~, and any motion starting device may be used that ~~would~~ transmit ^{and} torque (rotation) at start of movement. Further, ^{while described} ~~a case wherein~~ ²⁵ ~~this is~~ mounted on a vehicle with an engine as a drive source ~~has been described, but should not be limited to this,~~ ^{the invention is not so}


and any drive source may be used as a matter of course, and ^{The transmission of the present invention} ~~this~~ may be mounted on a hybrid vehicle. Further, ^{while} the ^{described} ~~above-mentioned~~ automatic transmission ^{embodiments are} ~~is~~ favorably ~~for~~ used in a FF vehicle, ^{again the present invention is not so} ~~but should not be limited to this~~, and can be used in a FR vehicle, a four-wheel drive vehicle, or vehicles with other types of drive systems.

Further, ^{while speed} ~~regarding~~ the reducing planetary gear ^{unit} according to the above first through sixth embodiments has been described as ~~one that~~ ^{ing} ~~reduces~~ ²¹ rotation speed of the ring gear by fixing the carrier while inputting the rotation of the input shaft into the sun gear, ^{the invention is} ~~but should not be~~ ^{so} limited ~~to this~~, and may reduce rotation ²¹ speed of the ring gear by fixing the sun gear while inputting the rotation of

the input shaft into the carrier.

~~Industrial Applicability~~

As described above, the automatic transmission according to the present invention is beneficially mounted on vehicles, such as automobiles, trucks, busses, and so forth, ~~and is particularly suitable for use with vehicles which~~ require reduction in size and reduction in weight ~~from mountability to the vehicle~~, and further require reduction ^{of} in shock ⁱⁿ of changing speeds.



ABSTRACT

A planetary gear ^{unit} PR and a clutch C1 for outputting reduced ^{speed} rotation are ^{located} ~~configured~~ on one ^{axial} side of a planetary gear unit PU ~~in the axial direction~~ (right side of the diagram) ^{located therebetween.} along with an output unit being disposed between a planetary gear unit and reduced rotation output means, and a clutch C2 ^{which} ~~for~~ ^{S/} connecting and disconnecting the rotation of an input shaft 2 ^{from} ~~input~~ to a sun gear S2^S and a clutch C3 ~~for~~ ^S connecting and disconnecting the rotation of the input shaft 2 ^{from} ~~input~~ to a carrier CR2^S are ~~configured~~ ^{axial} on the other side ~~(left side of the diagram)~~ of the planetary gear unit PU, in the axial direction. By doing so, ^{with a transmission} ~~Compared to the case~~ wherein a clutch C2 or clutch C3 is ^{located} ~~configured~~ between the planetary gear PR and the planetary gear unit PU, the planetary gear PR and the planetary gear unit PU can be ^{located} ~~configured~~ close together, and a ^{which} ~~transmitting~~ member 30 that transmits the reduced ^{speed} rotation ^{can be made} becomes shorter. Further, compared to the case wherein, for example, the clutches C1, C2, C3 are ^{located} ~~configured~~ together on one side of the axial ~~direction~~, the construction of an oil line is simplified.

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supply to their servos

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